FIFTY-FIRST ANNUAL REPORT

OF THE

SECRETARY

OF THE

State Horticultural Society

OF

MICHIGAN

FOR THE YEAR 1921

BY AUTHORITY

FORT WAYNE PRINTING COMPANY
CONTRACTORS FOR MICHIGAN STATE PRINTING AND BINDING
FORT WAYNE, INDIANA
1922

East Lansing, Michigan,

January 1, 1922.

To Hon. Alexander J. Groesbeck, *Governor of Michigan:*

In accordance with the legal requirements, I have the honor to submit to you for your inspection and approval, the Fifty-First Annual Report, with supplementary papers of the Michigan State Horticultural Society.

Your esteemed consideration and approval of this volume will be gratefully appreciated.

Most respectfully submitted,

T. A. FARRAND,

Secretary, Michigan State Horticultural Society.

MICHIGAN STATE HORTICULTURAL SOCIETY.

OFFICERS ELECTED AT ANNUAL MEETING, GRAND RAPIDS, 1921.

OFFICERS

PRESIDENT—GEORGE A. HAWLEY, Hart.
VICE-PRESIDENT—A. J. ROGERS, Beulah.
SECRETARY—T. A. FARRAND, East Lansing.
TREASURER—J. POMEROY MUNSON, Grand Rapids.

EXECUTIVE BOARD

A. J. ROGERS, Beulah.
GEO. FRIDAY, Coloma.
E. J. VER DUYN, Novi.
C. P. HALLIGAN, East Lansing.
A. M. BULLOCK, Lapeer.
ROBERT ANDERSON, Covert.

TRUSTEES OF LYON MEMORIAL FUND

PRESIDENT—G. C. MONROE, South Haven.
SECRETARY—JAMES SATTERLEE, Lansing.
TREASURER—HON. CHAS. W. GARFIELD, Grand Rapids.

EXPERIMENTAL COMMITTEE

GEORGE HAWLEY, Hart—Hort. Pres. Ex Officio.
C. E. BUSKIRK, Paw Paw—Representing Grape Growers.
GEO. FRIDAY—Representing Small Fruit Growers.
ROBT. ANDERSON, Covert—Representing Peach and Plum Growers.
H. BLAKESLEE CRANE, Fennville—Representing Apple and Pear Growers.
HARRY RACKHAM, Northville—Representing Apple Growers.
A. J. ROGERS, Beulah—Representing Cherry Growers.

INTRODUCTION.

The program for the midwinter meeting was arranged for and held during Farmers' Week at M. A. C. Assistance was given in every possible way by the Faculty and Horticultural Department staff to make this meeting a success.

The program was arranged to discuss topics not taken up at the annual meeting, yet interesting to the growers.

While the attendance was not as large as at some previous meetings, yet it proved a very important and interesting one, as at this meeting, a new policy was established in appointing a horticultural committee representing the different fruit interests, to co-operate with the Horticultural Department in working out experiments to projects which would meet the needs of the greatly increased and growing interest along their lines, a report of which has been given.

The secretary has arranged for calling and attended all of the meetings of this committee. Following the invitation to have the summer tour through Oceana and Mason Counties, this was arranged for, making the general starting point from the Graham Experimental Station at Grand Rapids, when a large number of the members and their families enjoyed an opportunity of observing the experimental projects which are being carried on.

There were 25 machines filled with enthusiastic Horticulturists starting from the station and this number grew to 60 in Oceana and Mason Counties. The splendid fruit crops demonstrating the results in the applications of good cultural practices and the splendid hospitality shown by the citizens of these counties will long be remembered by those making this trip.

In behalf of the society and the Horticultural committee, an invitation was extended to the State Board of Agriculture to meet with your committee and some growers at the Graham Experiment Station. The invitation was accepted and an informal meeting was held, which gave an opportunity for the members of the State Board and your committee and other growers present to get acquainted.

The committee very briefly presented an outlining of the problems and needs of the growers present and future, and the necessity of support in working out these problems with a greatly increased growing interest along horticultural lines throughout the state.

The work being carried on was heartily endorsed by the members of the Board and assistance was assured in enlarging the scope of the work to meet the demands.

The secretary assisted in making out a program for the Huron Fruit Belt Horticultural Society held at Almont November 8, which was well attended, considering the day, about 50 being present. Prof. Marshall and Prof. Dutton and Treasurer Munson addressing the meeting.

Other meetings were held where the extension work in fruit growing was carried on and the interest of the society looked after as well.

THE FIFTY-FIRST ANNUAL MEETING OF THE MICHIGAN STATE HORTICULTURAL SOCIETY WAS HELD IN THE PRESS HALL, GRAND RAPIDS, MICHIGAN, ON DECEMBER 6, 7, 8, 1921.

OPENING SESSION.

ADDRESS OF WELCOME, EDMUND W. BOOTH, PRES. GRAND RAPIDS PRESS.

It is perhaps fitting that a newspaper man should welcome you, for I find that it was a newspaper man, Henry S. Chubb, of Grand Haven, who sent out the call for the first organization meeting of this society, and a Grand Rapids newspaper man, Jonathan P. Thompson, was elected President at the Society's first annual meeting.

In coming to Grand Rapids you do not come among strangers. On the contrary, it is a homecoming for you—a return to the Society's place of nativity—a visit among old friends and to places that are historic in the development of Michigan's fruit growing industry. It was here that the Michigan Horticultural Society was organized fifty-one years ago and it was here that western Michigan's first nursery was started by Abel Page in 1836. Page collected such wild fruits and berries as he could find, improved them by cultivation for the gardens of the pioneers, and planted the seed of the apple, the cherry, the plum, the pear, and brought scions from the East to graft upon the seedlings.

The first fruit marketing association in Michigan, and perhaps in the country, was organized in Grand Rapids. That was more than forty years ago when peach was king and Grand Rapids its capitol. The work of this association brought buyers from all parts of the country and gave Western Michigan its first fame as a fruit producing district. It established Grand Rapids as the greatest primary wholesale market in the country, a rank which Grand Rapids still holds.

Grand Rapids is also the home of citizens eminent in horticulture and first among those I name Charles W. Garfield, for years your secretary and for a number of years secretary of the American Society, who all through life has been an apostle of the beautiful in trees, in shrubs and flowers, a lover of nature and of children and of his fellow-men, and whose influence is continually felt in our midst to make Grand Rapids a better and still better city. This is the home, too, of Robert Graham, for twelve years Chairman of the State Board of Agriculture, and who gave to Michigan the experimental and demonstration farm, which bears his name and which must influence greatly the future of Michigan fruit growing. This is the home also of Oscar Braman, Henry Smith, Charles Wilde and J. P. Munson, who have done so much to point the way to success in fruit growing by scientific methods. Mr. Munson's father, William K. Munson, was a leader in viniculture in western Michigan and the originator of the Kind and other varieties of market grapes. I must not forget, too, that W. R. Roach, world famous as a canner of fruits and vegetables, is a citizen of Grand Rapids, as is also W. S. Thomas of the Thomas Canning Company both to be counted among the good friends of the fruit industry. Among our financial men are practical farmers like Dudley A. Waters and William H. Anderson, and there is

not a bank in town but that has on its directorate members who are either actual farm owners or who are in very close touch with farming interests and know the language of the farmer and the fruit grower and understand the fruit growers' needs.

Grand Rapids is happy to welcome you because you are a body of representative substantial citizens and prominent among those who are working to build a greater and more successful Michigan. You are producers adding to the wealth of the country and contributing by your enterprise to the needs and demands of the people broadly. Not many of our citizens, I fear, appreciate as they should the vast wealth you are bringing to our state and the strategic position occupied by the agriculturist and horticulturist in all that makes for our prosperity and business success. If I were to look for a barometer to foretell business and world conditions, I would turn not to Wall Street with its great banks and its great millionaires, but rather to the men of the soil and men engaged in agriculture. Each one of us benefits through your prosperity or suffers by the lack of it. When you prosper, we prosper likewise. When you have trouble making both ends meet, we do also. The farmers represent half of the country's buying power and the sooner America makes it easier for the farmer and horticulturist to prosper, the sooner will the country reach normal conditions.

In looking up the word horticulture I find that Webster defines it as "the science and art of growing fruits, vegetables and flowers and ornamental plants," and so I am impressed with the fact that in addition to being counted among the substantial business people of our state, you are also to be classed with the scientist and artist. And when I consider the tremendous obstacles that you must regularly confront in fighting plagues of insects and of fungus diseases, I feel that all of you must be made of heroic stuff and be men and women of stalwart, courageous character. Therefore, in welcoming you most sincerely, do we feel that you are among the very finest and best of our citizens.

We are citizens together of a great state, great in population and steadily growing. Michigan now stands seventh, whereas, in 1900 it was ninth. In the last ten years Michigan increased 30% while the United States as a whole had a growth of 14%. We have a population in excess of 3,360,000. This alone is a very considerable market and you may very well ask whether you are meeting to the full the opportunity in Michigan as a market for your products.

The value of the farm products in Michigan last year amounted to over half a billion of dollars, which means that the 196,647 farms averaged $2,903 per farm. This sounds good, but it is not as good as Oregon, which last year with its Hood River Valley apples as its greatest asset, averaged $4,042 per farm and California, practically all fruit and with a scientific marketing system, yielded $5,566 per farm. Michigan with its natural fruit belt soil and its climate has a chance to be first not only in small fruits, where it now leads, but in apples also, where it is behind other states like Oregon.

I look out from my window into the attractive windows of a grocery store and of late boxes of beautiful apples that have been on exhibition in the windows of that store, but they have not been Michigan apples. They were shipped two thousand miles to compete with the apples of our own state. This hurts the Michigan pride and the Michigan pocket-

book. I should like to suggest as a slogan for you, "Sell Michigan Apples in Michigan," and your organization developed with an end in view.

Now let me, in closing, welcome you to this hall and to this building. The Grand Rapids Press has for years sought to be a booster of your Society, and I wish to assure you that whenever you want a meeting place that this hall and building are at your disposal. If you will come again next year, we will do everything in our power to cooperate with you and this hall may be used for your convenience and without expense.

RESPONSE, GEO. A. HAWLEY, PRES. MICHIGAN STATE HORTICULTURAL SOCIETY, HART, MICH.

Knowing as I did the reputation of Mr. Booth and his love of always telling things just as they were—never deviating from the truth—I am satisfied that he would say some mighty nice things about us. I only wish that I had time to say all the things I wished to about Grand Rapids and what it means to us in western Michigan. It is sufficient to say that Grand Rapids is "our City." When I am away from the state and anyone asks me where I come from I say, "Hart," but I always add, "Hart is just a little way from Grand Rapids."

This meeting today is a homecoming as the speaker has said. Fifty-one years ago we were born in this city in a small back room of a bank building, where a few enthusiastic pioneers realized the horticultural possibilities of Michigan and formed this Society and dedicated it to horticultural interests of this State. They dedicated it to the building of beautiful homes and surrounding them with shrubbery and flowers. We have gone through all phases of growth. We have had all the infantile diseases since that time. At times it seemed that we might cease to exist, and yet today we come a sturdy, worth-while society with a long, long life to live and a great deal to do.

I used to think, when I was thirty or forty years younger and a great deal wiser than I am today,—I presume the same thing has come into all your minds—that the work of the Horticultural Society would cease because we would run out of material to talk about. About the same time in my life I figured that if I could spend four or five years with the Society, I would have everything done and would not have to ask a question about horticulture because I would be pretty well decided that everything was settled. I now find that we have many more questions to consider and that there is a great deal more for this Society to do than ever before. When this Society was formed, the apple scab was hardly thought of. We knew nothing of lime or sulphate and if we had mentioned a spraying machine gun people would not have known what we were talking about.

Probably no meeting of this Society has passed without warning the grower that the best policy in packing fruit is to pack the same quality in the bottom as in the top, and yet today we have the same trouble that was discussed at that time. But we had made progress and by the continual operation of societies of this kind and the continual vigilance of the men who are interested in the fruit industry, the time will come when the package of fruit from Michigan can be guaranteed and the purchaser can be assured that the same quality is at the bottom as at the top. You wonder that it takes so long to fix such a simple proposition in the minds of people. It is simply a business proposition. You must please people and treat them right in the end of the deal.

We as horticulturists are interested principally in our farms. We are interested in the growing of our products, but we are just as much interested in Grand Rapids and all of the cities of the State. Their industry is absolutely necessary to our prosperity. We sell our products in the city and expect to get top price. Did you ever stop to think what happens when there is extra prosperity in any community? You will find about four men on every corner trying to sell stock. These men bring the money back to Grand Rapids.

I wish to mention at this time the new policy that has been instituted by the Horticultural Society during the past year for the purpose of working more closely with the Agricultural College of our State. We want to make Michigan the foremost agricultural state in the Union and our Horticultural Department should be the greatest. It needs the support of every fruit grower in order to bring it to that perfection. The Legislature usually favors those who are most active in asking favors, and it is necessary that we work together for the best interests of the Agricultural College and particularly the Horticultural Department.

In concluding this meeting from now on, in order that no one at any time should feel that he is not treated fairly, I wish to say that there will be many discussions and our time may be very short, so I shall consider it my duty when anyone strays from the topic at hand to call them to order. You all know how easy it is to pass from one topic to another and the first thing we know we haven't time to consider the important subject before us. Will appreciate the cooperation of all by being brief and concise. Thank you.

REPORT OF EXPERIMENTAL COMMITTEE, C. E. BUSKIRK, CHAIRMAN, PAW PAW, MICH.

The Horticultural Committee on Experiment Station Work held their first meeting in Grand Rapids, in March, 1921. The Horticultural Department of the College was represented by Messrs. Halligan, Farrand, Dutton, Partridge and Marshall. The various members of the Horticultural Department had outlined the work they hoped to carry on this coming year and this was presented to the Committee and carefully gone over, item by item, and suggestions made. Some parts were eliminated and some were added to. A few of the projects presented were:

Apples—Fertilization; different kinds; methods of applying, etc. Sod vs. clean culture, Alfalfa vs. rye, vetch, etc. Spraying. Pruning vs. unpruned, also light pruning.

Pears—Spraying. Method of starting non-productive orchards into productive orchards.

Peaches—Fertilizer. Varieties. Borer control.

Grapes—Fertilizer. Pruning, Spraying, Leaf hopper and moth control.

Cherries—Fertilizer. Spraying. Better facilities to market.

Small Fruits—Fertilizer.

Fertilizing was the one item common to all projects.

The next day the Committee visited the Graham Experiment Farm, and the different projects there were explained to us and the Committee were asked for suggestions. The experiments there are along different varieties, pruning vs. non-pruning, heavy vs. light pruning, sod vs.

clean culture and a record of costs, alfalfa vs. rye, vetch and other cover crops.

The Committee held a second meeting at Grand Rapids in September at which time they met with the State Board of Agriculture. The various projects at the Experiment Farm were gone over and explained in order that they might get a better idea of the work carried on there; also the importance of it. Each member of the Committee was called upon to explain his particular line and the things he thought were needed. The State Board also told of some of the things that were troubling them. Among other facts we received was that the Horticultural Department had not received all that was coming to them for the reason that the money was generally expended in the direction of the most pressure. Mr. Farrand informed them that the pressure was coming from the Horticultural interests from now on.

EXPERIMENTAL PROJECTS, C. P. HALLIGAN, PROFESSOR OF HORTICULTURE, MICHIGAN AGRICULTURAL COLLEGE.

There are some very encouraging facts presented in the 1920 census reports that show very promising prospects for Michigan fruits. This is particularly true of apples. In 1909 we had 151,000,000 bearing apple trees, while in 1919 the reports show that the presence of 115,000,000 or a decrease of 23.8% during the past decade. 1910 also saw about 60,000,000 young apple trees not yet in bearing, while in 1920 the census shows just a few more than 36,000,000 non-bearing trees. This great decrease in number is particularly characteristic of the Middle West although there are fewer trees in practically all of the states, except in the Northwest, than in 1909. Iowa, for instance has lost nearly one-half of her bearing trees; while in Illinois, Kansas, Nebraska and Missouri there has also been a startling decrease. Michigan shows a decrease of about 2,000,000 bearing apple trees, most of which were probably bearing apple trees on the general farms of southern Michigan.

These census reports indicate that there should be an increasingly better market for Michigan apples, and that the demand for apples in the future will be in the small towns and farming communities of the Middle West as well as in the larger cities. This general proportion of decrease of bearing trees in the case of apples is quite similar to the present status of other tree fruits and the decrease in bearing trees is particularly marked in the case of peaches. In the opinion of the speaker there was never a time in the history of fruit culture when the prospects for increasingly better markets were more favorable than at the present time, and that the fruit orchards now in bearing were never more worthy of proper care and good culture than at the present time.

The experimental projects of the Horticultural Department are based largely upon the basic problem of producing more and better fruit on our present acreage in Michigan and all problems that are related to this main theme are of interest and importance to us. We are extremely pleased with the services that your Experimental Committee are rendering us in the work we are undertaking, and we hope that each year you will be informed of the work that we are trying to do and of the results of any experiments that are worth reporting at the annual meetings.

We have at present for experimental purposes 100 acres of land at the Graham Horticultural Experiment Station, fifteen acres at South Haven Experiment Station, and five acres of vineyard that we have

rented on a five-year lease on the Buskirk farm at Paw Paw. In addition to this, we have imposed upon the kindness of many of the fruit growers throughout the state for the use of their orchards and vineyards for experimental work. We wish to express our appreciation at this time for their generosity and their spirit of cooperation that has been exemplified in all our projects upon commercial farms. The following is an outline of the experiment projects in horticulture in 1920 and 1921:

Project

PRUNING EXPERIMENTS.

No. 1 J. P. Munson farm, Grand Rapids, 1921. To determine the most economical kinds and degrees of pruning in a five-year old Jonathan apple orchard.

No. 2 Graham Experiment Station, 1919. To ascertain the effect of different degrees and kinds of pruning of apple trees from the time of setting through a period of years on growth and production.

No. 3 Graham Experiment Station, 1920. A demonstration of results in the permanent form of trees when pruned on the standard open-head system; the modified leader system, and unpruned leader system.

ORCHARD CULTURAL EXPERIMENTS.

No. 4 Graham Experiment Station, April 1921. To ascertain the practicability of growing Montmorency cherries in alfalfa sod supplemented by mulching and fertilizing.

No. 5 Graham Experiment Station, April, 1920. A test of the several kinds of cover crops and their relative effect on tree growth and fruit production.

No. 6 Graham Experiment Station, April 1920. To compare the effect of different systems of culture on young apple trees including alfalfa, clover and clean cultural plots.

ORCHARD FERTILIZATION EXPERIMENTS.

No. 7 Quinlan Orchard, Grand Rapids, April 1920. To study the effects of different amounts of nitrogenous fertilizers applied at different times, on growth and fruit production, and a study of the physiological changes resulting.

No. 8 Farrand Orchard, Eaton Rapids, April 1920. Demonstrational experiment on the value of the several kinds of fertilizers in a soil depleted orchard.

No. 9 Graham Experiment Station, 1920. To determine the relative nitrogenous requirements of trees growing in grass sod, alfalfa sod, and under clean culture with cover crops.

No. 10 Graham Experiment Station, 1921. To ascertain the effects of nitrogenous fertilizers on peaches applied at different times of the growing season.

POLLINATION EXPERIMENTS.

No. 11 College Orchard, April 1921. To determine to what extent Northern Spy, Oldenburg and Hyslop are self-sterile; and if self-sterile, to determine which of the standard varieties of Michigan may best be used as pollinizers.

No. 12 South Haven Experiment Station, 1921. To determine to what extent common varieties of plums are self-sterile and to what extent interspecies pollination may take place.

No. 13 South Haven Experiment Station, 1921. To determine if the kind of stock has any effect upon the degree of receptiveness between two species of plums not commonly receptive in cross-pollination.

GRAPE EXPERIMENTS.

No. 14 Carl Buskirk farm, Paw Paw; J. P. Munson farm, Grand Rapids; and Waters vineyard, Paw Paw. (1) to determine the number of buds to be left on vines with different degrees of vigor on the yield and quality of the grapes produced; (2) The fruiting habits of the grape in Michigan.

No. 15 Carl Buskirk farm, Paw Paw, 1921. A study of the fertilizer requirements on the grape and the relationship of quantity production to the amount supplied.

TREE FRUIT BREEDING

No. 16 South Haven Experiment Station, 1918. Tree fruit breeding with pears for fire blight resistance; with peaches to obtain a peach hardier in bud and of good commercial character; with apples a study of the inherent characters of the standard varieties in crosses.

VEGETABLE EXPERIMENTS.

No. 17 East Lansing, 1916. Crossing and selection of strains for a better early tomato that will ripen up its crop most uniformly early.

No. 18 Graham Experiment Station, 1919. To test relative production of the different strains of the Late Petoskey Potato.

No. 19 Potato seed certification work. To promote the culture and distribution of disease-free seed stock.

No. 20 Graham Experiment Station, 1921. To ascertain the effect of sulphur as a fertilizer for potatoes, on yield and on development of potato scab; also the increased production resulting from the use of the several kinds of commercial fertilizers.

No. 21 Fremont Canning Company, Fremont, 1921. To test the comparative yields of eight leading varieties of canning peas and resistance of strains to root rot.

No. 22 Ionia, Sanilac and Oceana Counties, 1921. To ascertain the relative effects of nitrogen, phosphoric acid, potash and sulphur on yields of crops of canning peas.

No. 23 Graham Experiment Station, 1920. Variety and strain test of strawberries.

No. 24 East Lansing, 1916. Testing new varieties of sweet corn, beans and other standard vegetables.

No. 25 East Lansing, 1921. Testing of vegetables and small fruits with overhead irrigation as compared with non-irrigation.

SMALL FRUIT FERTILIZATION EXPERIMENTS.

No. 26 Daley's farm, Riverside; Friday Bros., Coloma. To ascertain the response with dewberries; red raspberries and black rasp-

berries to commercial fertilizer and the possibility of increasing yields by their use.

CULTURAL PROJECT WITH YOUNG APPLE TREES.

Object: To compare the effect of various systems of culture for growing young apple trees in regard to growth and earliness of bearing.

The orchard used in this experiment is known as Blocks X and XI on the Graham Horticultural Experiment Station. The trees are of six varieties planted in groups of four rows each. The rows run East and West across both blocks.

Rows from South.	Varieties.
1–4	Duchess
5–8	Grimes
9–12	Baldwin
13–16	Stayman
17–20	Spy
21–24	Rhode Island Greening

The location of the different plots is shown on the accompanying diagram of the Blocks X and XI.

A cover crop of rye was planted in each of the five plots in this experiment during July 1919, the year that the orchard was set. In the spring of 1920 it was plowed under about blossoming time and kept dragged every two or three weeks during the growing season.

About the middle of July a cover crop of clover was sown in Plots 1 and 2, and alfalfa in Plots 3, 4, and 5. A very good stand of alfalfa was obtained, but the catch of clover was poor. Plot 2 was re-seeded to clover on a late snow in the spring of 1921, with a good stand as a result. However, there was not sufficient growth made to justify removing it when the clover was mowed in June.

In March 1921 a straw mulch was placed around each tree in Plots 2 and 3. The straw was applied in a circle six to eight feet in diameter and about six inches deep. Plot 1 was plowed May 18, 1921 and dragged five times during the growing season. July 29th a cover crop of rye and vetch was sown.

The alfalfa in Plots 3, 4, and 5 was clipped three times during the year. All three clippings were removed from Plot 3. The first clippings from Plots 4 and 5 were placed around the trees as a mulch. The second and third clippings were removed as a hay crop.

An application of one-half pound of nitrate of soda per tree was applied to each tree in Plot 5.

The following is the cost of each individual plot, beginning in March 1921. Labor costs are calculated at $0.30 per hour for man labor and $0.60 per hour for man and team.

PLOT 1 (120 TREES): CLEAN CULTURE WITH COVER CROP.

Date	Labor	Cost
5-18-21	Plowed.....8 hrs. time, team and one man.....	$4,80
5-22-21	Rolled.....1 hr. time, team and one man.....	.60
5-27-21	Dragged.....1 hr. time, team and one man.....	.60
6- 8-21	Dragged.....1 hr. time, team and one man.....	.60
6-24-21	Dragged.....1 hr. time, team and one man.....	.60
7- 7-21	Dragged.....1 hr. time, team and one man.....	.60
7-27-21	Dragged.....1 hr. time, team and one man.....	.60
7-29-21	Drilling cover crop, 1 hr. time, team and one man	.60
7-29-21	Cost of rye and vetch.....	2.00
	Total cost of Plot.....	$11.00
	Cost per individual tree.....	$ .091

PLOT 2 (120 TREES): CLOVER WITH STRAW MULCH.

3-30-21	30 150-lb. bales straw at $0.60.....	$18.00
4- 5-21	Spreading straw 5 hrs. time at $0.30 per hr.....	1.50
4-11-21	Re-seeding with clover ½ hr. at $0.30 per hr.....	.15
4-11-21	Three quarts clover seed at $0.20.....	.60
6-16-21	Mowing 1 hr. time, team and man.....	.60
11- 4-21	Straw one load at $7.00.....	7.00
11-20-21	Spreading straw 5 hrs. at $0.30.....	1.50
11-22-21	Wire screens placed around trees.....	3.60
	Total cost of Plot.....	$32.96
	Cost per individual tree.....	$ .273

PLOT 3 (96 TREES): ALFALFA WITH STRAW MULCH

Date	Labor	Cost
3-24-21	24 150-lb. bales straw at $0.60.....	$14.40
4- 4-21	Spreading straw—4 hrs. time at $0.30 per hr.....	1.20
6-16-21	Mowing and raking, 1 hr. time, team and man.....	.60
	Cocking alfalfa 2 hrs. time, one man at $0.30.....	.60
6-18-21	Loading and hauling alfalfa to barn, 2 hrs. time, two men and team.....	1.80
7-25-21	Mowing and raking 1 hr. time team and man.....	.60
	Cocking alfalfa 1 hr. time, man.....	.30
7-27-21	Loading and hauling alfalfa to barn.....	.60
9-20-21	Mowing and raking, 1 hr. time team and man.....	.60
	Cocking alfalfa 2 hrs. time, 1 man at $0.30.....	.60
9-23-21	Turning alfalfa cock over 1 hr. time $0.30.....	.30
	Loading and hauling alfalfa to barn 2 hrs. time 2 men, team.....	1.80
11- 4-21	Straw Mulch 1 load at $5.50.....	5.50
11-23-21	Wire screens placed around trees.....	2.88
	Total cost of Plot.....	$32.98
	Cost per individual tree.....	$ .353

Date	Labor	Cost
6-19-21	Value of alfalfa removed 2500 lbs. at $25 per ton	$31.25
7-27-21	Value of alfalfa removed 500 lbs. at $25 per ton	6.25
9-24-21	Value of alfalfa removed 2000 lbs. at $25 per ton	25.00
	Total value of alfalfa removed	$62.50
	Total cost of Plot	32.98
	Net Profit	$19.52

PLOT 4 (96 TREES): ALFALFA WITH ALFALFA MULCH, THE SECOND AND THIRD CLIPPINGS BEING REMOVED FROM THE PLOT

Date	Labor	Cost
6-16-21	Mowing and raking, 1 hr. time, team and man	$ .60
6-17-21	Spreading alfalfa around trees 2 hrs. time, man	.60
7-25-21	Mowing and raking, 1 hr. time, team and man	.60
7-21-21	Cocking alfalfa 1 hr. time man	.30
7-27-21	Loading and hauling to barn	.60
9-20-21	Mowing and raking 1 hr. time, team and man	.60
	Cocking alfalfa 2 hrs. time man at $0.30	.60
9-23-21	Turning alfalfa cocks over 1 hr. time	.30
9-24-21	Loading and hauling alfalfa to barn	1.80
11-23-21	Wire screen placed around trees	2.88
	Total cost of Plot	$ 8.88
	Cost per individual tree	$ .093
7-27-21	Value of alfalfa removed 500 lbs. at $25 per ton	$ 6.25
9-24-21	Value of alfalfa removed 1500 lbs. at $25 per ton	18.75
	Total value of alfalfa removed	$25.00
	Total cost of Plot	8.88
	Net Profit	$16.12

PLOT 5 (72 TREES): WITH ALFALFA MULCH—NITRATE OF SODA APPLIED UPON THE MULCH—THE SECOND AND THIRD CLIPPINGS BEING REMOVED FROM THE PLOT.

Date	Labor	Cost
4- 9-21	¼ lb. Nitrate of Soda applied per tree at 4½ cts. lb.	$ .81
4- 9-21	½ hr. time to apply same	.15
4-27-21	¼ lb. Nitrate of Soda applied per tree	.81
	½ hr. time to apply same	.15
6-16-21	Mowing and raking ¾ hr. time, team, man	.45
6-17-21	Spreading alfalfa around trees 1½ hrs.	.45
7-25-21	Mowing and raking ¾ hr. time, team, man	.45
	Cocking alfalfa 1 hr. time	.30
7-27-21	Loading and hauling to barn	.60
9-20-21	Mowing and raking 1 hr. time, team, man	.45
	Cocking alfalfa, 1½ hr., man	.45
9-23-21	Turning alfalfa cock over 1 hr. time	.30

Date	Labor	Cost
9-24-21	Loading and hauling alfalfa to barn	1.35
11-23-21	Wire Screen placed around trees	2.16
	Total Cost of Plot	$ 8.88
	Cost per individual tree	$ .123
7-27-21	Value of alfalfa removed 500 lbs. at $25 per ton	$ 6.25
9-29-21	Value of alfalfa removed 1000 lbs. at $25 per ton	12.50
	Total value of alfalfa removed	$18.75
	Total cost of Plot	8.88
	Net Profit	$ 9.87

RESULTS OF FERTILIZATION IN OHIO ORCHARDS.

PROF. R. B. CRUICKSHANK, OHIO STATE UNIVERSITY.

I have often wanted to attend a Michigan State Horticultural Society meeting and therefore, I am glad to be here. It is a pleasure also for me to bring to your greetings from the Ohio State Horticultural Society and from the American Pomological Society. The latter will begin its meetings tomorrow in Toledo, Ohio. You are all invited to attend after your convention closes. Dr. L. H. Bailey, one of your former Michigan men is president of the Society and will be in Toledo at that meeting. There are many members of that Society in Michigan at the present time, and we hope that in the coming years that there will be many more in it. We know there are good fruit growers in this State and we want a good representation from your group.

The subject to which I have been assigned is "Results of Fertilization in Ohio Orchards." I shall discuss the topic entirely from the practical side with little of the technical factors involved. In order to bring the situation a little more clearly to your minds I am going to tell you a little about the pomological geography of the Buckeye State. We have two fruit sections in Ohio that are important. Lake Erie washes the northern shore of the state and due to its moderating effects we have there a considerable fruit section similar to yours along Lake Michigan. There are grown there apples, pears, peaches, plums, cherries, grapes and berries. In the southeastern and southern parts of the state, practically all along the Ohio river, we have a rough, hilly country. Many places in that section have developed largely into fruit producing areas. This is due perhaps to two things: the elevation gives good air drainage and much of the land is not well adapted to general farming. Fertilization work began in the southern part of the state in that hilly section.

The land, except in the valleys, never was very rich and much of it had been farmed for a long time without having returned to it anything in the way of fertilizer. The soil was run down. The trees were becoming less and less productive, showing less growth, less vigor, and less color of leaf. The trees would bloom irregularly and there would be small fruit production following. The condition in many instances was extremely discouraging. The trouble was laid to late frosts, lack of

cross pollination, running out of varieties, change of climate and many other causes. About ten or twelve years ago, the Department of Horticulture of the Ohio Agricultural Experiment Station began work in that section in an effort to improve the situation. It began to test fertilizing materials, and what I have to say is a report of what was learned in those experiments and of how the practice has spread into other parts of the state. The work began with field experiments. Various rows in the orchards were fertilized with different materials and different combinations of materials. One row would have nitrate of soda, another acid phosphate, another muriate of potash, another nitrate of soda, and acid phosphate combined, another nitrate of soda, muriate of potash combined, another acid phosphate and muriate of potash combined, another all three materials and others were left as checks to which nothing was applied. In some of the orchards certain of the rows were mulched with straw; in other instances the trees were given double amounts of fertilizers and in others the amounts were cut in half. Some rows were given applications of manure. In this way, it is possible to test the various materials which might be expected to give beneficial results.

Perhaps we can get to the heart of the matter most quickly and definitely by saying first of all that those rows or plats that were fertilized with nitrate of soda alone or in combination with other materials responded immediately to the application. The first year the application was made after the bloom and results began to appear in about two weeks. The trees making a better start and the leaves were a darker green. They looked much more vigorous than those not fertilized. In every orchard in which this work was carried on the same general improvement was shown. The same thing is true in the general orchard practice in the state.

Acid Phosphate was used alone and in combination with other materials. Alone it seemed to have practically no effect in producing greater fruitfulness or vigor. When used with nitrate of soda the results were sometimes a little better than with the nitrate alone. This was especially true in the Pennsylvania experiments on orchard fertilization.

In the Ohio experiments potash has failed to give any beneficial results; in some other states it has shown itself to be profitable. Whether you would get any benefit from using it on your sandier ground I do not know.

A word or two concerning other materials carrying nitrogen may be of interest. On those soils in which the experimental work was carried on manure gave rather indifferent and inconsistent results. It is probable that in some of these cases the soils were too much run together to utilize the manure in full value immediately when used only as a top dressing. Its continued use, however, in other sections of the state has operated to maintain and increase satisfactorily the fertility of orchards. Bone and tankage were used in some orchards and again with these materials beneficial action was slow. For the first five years at least, results were too inconsequential to be considered of value when compared with those accruing from the use of nitrate of soda. However, beginning about the sixth year those plats treated with bone and tankage have begun to improve more conspicuously. The grass in the orchards is beginning to be of better quality, thicker and higher than that in

the nitrate and acid phosphate plats. It may be found out later then that these materials combined with acid phosphate and nitrate of soda or sulphate of ammonia would be an excellent application. The bone and tankage would tend to carry over from year to year and to accumulate more in the soil and thus give more reserve of plant food materials. There are as yet no experimental results in connection with the comparison of the values of nitrate of soda and sulphate of ammonia as carriers of quickly available nitrogen. However, both materials have been used in general practice in all sections of the state. There appears to be no essential difference as to their beneficial effects in improving the vigor of trees and their production. The factor that has governed the choice by Ohio growers during the past few years has been the price. As sulphate of ammonia has been a little cheaper, large amounts of it have been used. Anything which I may say in general regarding the use of quickly available nitrogenous fertilizers applies equally to sulphate of ammonia and nitrate of soda.

It has been, therefore, the fertilizers containing nitrogen in a quickly available form which have given us such remarkably good results in Ohio. The first year that nitrate of soda was used experimentally it was applied after the trees had bloomed. This resulted in a general toning up of the trees but gave little advantage in the way of increased production except that the apples were of better size. Since then the practice has been to make the application from two to three weeks previous to blossoming. This has operated to increase materially the set of fruit and has enabled the trees to carry this increased set to maturity, thus providing much larger crops.

It is quite generally agreed that our fruit trees at time of blossoming need considerable food materials in the spurs for satisfactory setting. At this season of the year there is little nitrification taking place in the soil and what is used is only that which may have been stored in the trees from the previous season's work. Unless, therefore, the soils have been strong and the growing conditions of the trees favorable there may be an insufficiency of stored-up food. This will mean a lack of full capacity on the part of the tree for fruit setting and there will be a lack of it in proportion to the lack of materials stored. Quickly available nitrogenous fertilizers applied somewhat previous to the blossoming period will be taken up by the tree and carried to the spurs in time to afford them more of this food in case it is needed. This has doubtless been the reason why the application of nitrate of soda or sulphate of ammonia has produced such remarkable results the same year that it was applied. In addition to a better set of fruit, it should be remembered that most of the spur growth for the next year's crop is made early in the season and a sufficiency of plant food while these spurs are developing should tend to better fruit bud development for the subsequent crop. These appear to be sufficient reasons for applying nitrogenous fertilizers in advance of bloom.

The practice in Ohio has been to use about five pounds of nitrate of soda or about three and three-fourths pounds of sulphate of ammonia per tree per year. These figures apply to trees about twenty to twenty five feet high. These amounts should, of course, be modified in proportion to the size of the tree and general fertility conditions in the soil. Many of our growers are using as high as ten pounds per tree. The

young trees not in bearing would need lesser amounts, probably not over a pound each and, perhaps, on quite small trees no more than a handful or two. In cases where severe pruning is done, fertilization should be reduced.

It appears to be necessary to fertilize every year. In those instances where a year or two have been skipped, there have been serious reductions in crops. There is little effect from nitrate of soda or sulphate of ammonia carried over to the following spring. The conditions which are related to the need for these nitrogenous materials are apparently recurrent.

Different methods of applying the fertilizing materials have been tried. Where the tree roots are practically filling all the space between trees, the practice should be to spread the fertilizer over the entire orchard floor except close to the tree trunks, where it would have no value. Where the trees are small and the roots are not occupying the whole space, the application may be in hollow bands, extending from a point about half way between the trunk and the outer drip of the branches to about the same distance or a little more beyond the tips of the branches. Whether it is to be put on cultivated ground or on sod or in a heavy mulch, it is simply broadcasted. The trees will get it in if applied two or three weeks previous to bloom. The results can be seen on the grass or cover-crop within four or five days.

In as much as it is often advisable to stimulate the growth of clovers and grasses, it would be of value some times to use the nitrogenous material over the roots of the trees and the acid phosphate farther out where it will be useful for the grasses alone.

Most of our orchards are sod orchards. They are not plowed or cultivated. Some of these orchards are mulched in addition, so the problem of getting enough mulching material into those orchards to conserve the soil moisture confronts the growers. This matter in our hilly sections is considerable of a proposition. Straw is hard to get and is too high in price. Some of the orchards are far from shipping stations and the long haul is costly. On the other hand a heavy mulch is of much advantage in crop production.

Those who are using the cover crop system are finding that some fertilization will help those crops. The best cover crop is usually the one that will give the most bulk to turn under in the Spring—leguminous or non-leguminous—and any additional growth which can be induced by fertilization is therefore of value.

The fertilization of the trees brought attention immediately to the fact that the grasses in the fertilized plats were also being stimulated to vigorous development. With each succeeding year, the ground cover became more dense and of better quality. Experiments were begun using double amounts of nitrate of soda and acid phosphate, namely ten pounds of each to a tree. It was found that it was possible to grow as much grass right in the orchard to be used for mulching purposes following the June mowing as could be furnished by applying a bale of straw to the tree. When nitrate of soda was used the cover developed was chiefly blue grass (timothy, red top and orchard grass). When acid phosphate was used red and white clover became predominant. Fertilization with a combination of these materials through a number of years brought in a luxuriant mixture of all of the plants mentioned above.

As much as 3500 pounds of sun-dried material to the acre have been grown right in the orchard under this system of fertilization. This mulch is gathered up around the trees or allowed to lie where it falls. This helps to conserve the soil moisture and gradually it becomes incorporated in the soil as organic matter. The problem of mulching, therefore, at least in orchards where the trees are not too large is rather well solved with the same materials used at the same time as for tree fertilization.

The work of fertilization, both experimentally and in practice began in the southern part of the state where the soil was obviously poor. It was there that results showed so quickly, and for a long time it was the only part of the state where commercial fertilizers were used. The northern part of Ohio has in general better land and the growers thought that with the application of manure now and then they were keeping their orchards in prime condition and were getting all the fruit they could expect. Gradually, however, these men began to try out commercial materials and now the practice or orchard fertilization is carried on practically all over the state. The growth of the practice is indicated by the following figures. In 1919, 466 tons of nitrate of soda were used for orchard purposes. This increased in 1920 to 1,029 tons and in 1921 dropped to 768 tons. During the same period sulphate of ammonia showed a growth of from 42 to 755 tons. These two materials totaled 508 tons in 1919, 1,115 tons in 1920 and 1,523 tons in 1921. In 1919, 22 counties were practicing orchard fertilization to a noticeable extent. In 1920 there were 38 counties and in 1921, 59 counties.

We have eighty-eight counties in the state. About three-quarters of them are, therefore, using nitrogenous fertilizers in their orchards. Not only are the poorer farms in the hilly sections getting these fertilizers, but also those located in better sections. The amount of nitrogenous material used this year in Ohio was enough to fertilize over one million fruit trees. We have not noticed any big results from the use of acid phosphate, but because we get a better grass we recommend that acid phosphate be used with an ammonia carrier.

I know you men will be interested in the results of one experiment where the sod mulch system was compared with the cultivation-cover-crop system, and where cultivation with fertilizers was compared with cultivation with no fertilizer. At the end of five years it was found that on the average there was practically no difference in the amount of fruit or the condition of the trees in the fertilized sections of the cultivated and sod-mulched rows. The sod-mulched system was, of course, cheaper. The fertilized rows under cultivation gave about forty per cent more fruit than the unfertilized rows under cultivation. This indicates clearly that where the nitrogen content of the soil is low the introduction of the nitrogenous fertilizers will be a benefit even in cultivated orchards.

A few years ago Ohio growers, particularly those in the northern part of the state where the conditions are much the same as in many sections of Michigan, did not think that they needed to fertilize orchards on good soil but results are now showing them that they do. If the trees are in sod, the grower cannot afford not to use nitrogenous material of some kind. I am positive, and I shall probably remain so until someone shows me where I am wrong, that an orchard growing in sod will

without exception, respond profitably to the application of a fertilizer carrying ammonia. A cultivated orchard is a different problem. Whether fertilizing the cultivated orchard will pay or not will depend upon the condition of the soil. If it is strong, it is probable that there would be no result; if the trees are getting old or the land is run down, it is probable that it would be. I do not think one would get such wide comparisons as on sod or that the differences would be noticeable so soon but I would recommend that these materials be used through several years or until one assures himself one way or the other. Some experiments show that fertilization in cultivated orchards does pay, others that it does not.

At present prices, the cost of five, six or seven pounds of nitrate of soda or sulphate of ammonia would be from about fifteen to twenty-five cents. This charge per tree is so small that a very few apples in addition would pay the price. No one, therefore, can afford not to make a fair trial.

It may be worth while to say something about the fertilization of young orchards. I believe that the advisable plan is to push them as hard as possible within reason in order to have as large a tree as one can at the time it should come into bearing. I believe that the use of quickly acting nitrogenous fertilizers will enable young trees to make a rapid growth earlier in the season with plenty of time left to mature their wood before cold weather sets in. This should enable one to put a little more growth upon the trees even under cultivation without undue danger from winter injury. About the time the trees should come into bearing, it may be advisable to discontinue the fertilization for a year or two.

By way of summary, I offer the following points.

1. Nitrogenous fertilization appears to be consistently necessary and profitable in a sod orchard wherever it may be.
2. Cultivated orchards may or may not need fertilization. Only a trial of several years' duration may determine the answer.
3 Nitrate of soda and sulphate of ammonia are the advisable materials to use.
4. Manure is, of course, valuable when it can be secured although even with its use it may be profitable to use in addition nitrate of soda or sulphate of ammonia.
5. Bone and tankage are too slow in action to warrant their use where immediate results are wanted.
6. In view of the facts that our soils are generally deficient in phosphorous and that both cover crops and sod are benefited by its use, acid phosphate is recommended to be used in conjunction with the nitrogenous material.
7. A considerable mulch may be grown within the orchard by the use, in somewhat larger amounts, of the same materials advised for the fertilization of the trees.
8. For early and best results nitrogenous fertilizers must be applied two or three weeks previous to blossoming.
9. In order to stimulate regular bearing, there must be annual fertilization.
10. The amounts to be used will vary from a handful to ten or twelve pounds per tree in proportion to the size of the tree.

11. Materials may be spread in hollow circles over the tree roots or over the full tree square, depending upon the size of the tree and the amount of ground cover it is desired to invigorate.

12. Because fertilization has invigorated trees, produced more healthy foliage, increased crops, induced more regular bearing, and stimulated better growth in cover crops and sod, the practice has become as important and as regular in many sections as spraying and pruning.

The following questions were asked Professor Cruickshank after his talk:

Greening: In your northern Ohio orchards does the use of commercial fertilizers delay the peach crop?

Cruickshank: There has not been much done with peaches. How much the peach crop is delayed, I do not know because I have not followed this particular work up, but those growers are using these fertilizers in lesser amounts on account of severer pruning. A reasonable application would not delay the maturity more than three or four days. If too much is used it would delay the crop more and it might be inclined to bring them on all at once.

Perkins: How does the application of these materials affect pears?

Cruickshank: We do not grow many pears, but the men who are growing them are getting results similar to those on apples from the application of these fertilizers.

Member: Is there any difference in the length of time in getting results using nitrate of soda or sulphate of ammonia?

Cruickshank: We have noticed no particular difference.

Dow: Do you know whether the nitrate of soda acts as a direct fertilizer or in an indirect way in neutralizing the toxic effect of the June grass? We all know that when we plow up a June grass sod the foliage changes from a yellow to a deep green. The Rothamstead Experiment Station in England has conclusively proven that there is a toxic effect from June grass.

I do not believe that we know as yet enough of the effects of toxicity to warrant the statement that it is an important factor in the lesser crops found in sod orchards in comparison with those in cultivated orchards.

For my own part, I am able to consider the subject better from other angles. We find that sulphate of ammonia will give us equally beneficial results as does nitrate of soda which I think would get around the factor of oxidation. Further, an experiment in southern Ohio reported in Ohio Bulletin No. 339 shows through a five year period that fertilized cultivated trees produced about forty per cent more fruit than unfertilized cultivated trees. The report of the Hood River Branch of the Oregon Agricultural Experiment Station for 1914-1915 says, "In every experiment in which nitrate of soda was applied to apple orchards in Hood River the plots to which this element was applied show a marked increase in vigor of growth of the trees, a decided improvement in color of the foliage, and in most instances a noticeable increase in production of fruit. The most pronounced results were derived from its application to matured trees of low vitality in orchards that have been kept *continuously under clean cultivation and without irrigation, since planting.*"

I have been able to double the growth on two year old trees in cultivation by the use of a handful of nitrate of soda per tree. I have in mind two orchards in sod which have been brought up from a state of low production to one of high production by the use of manure rather than nitrate of soda, although it took a much longer time. These instances lead me to believe that the increase in vigor and production is due to available nitrogen rather than counteraction of toxicity.

Gourley while in New Hampshire showed that under sod nitrofication proceeded very slowly, but that under a system of good tillage nitrates were usually present in excess of the needs of the trees. I believe that this, therefore, is the heart of the explanation. In other words, there is greater need in practically all cases for the application of a nitrogenous material to a sod orchard than to one in cultivation, but that it is possible for cultivated soils to become sufficiently deficient in their power of supplying nitrates to warrant the application of a nitrogen carrier.

I believe with you that there is still much to clear up concerning the fundamental problems in connection with orchard fertilization and I trust that the various experiment stations will continue their good work until these problems are answered.

Very truly yours,

R. B. C.
Professor.

MEMORANDUM.

The New York Agricultural Experiment Station, at Geneva, has positively proven that nitrate of soda on their soils at the Station does not benefit apple trees that are in clean cultivation for a part of each season, and they have confirmed these results in a number of other orchards also under clean cultivation.

The Ohio Agricultural Experiment Station has proven conclusively that a number of orchards in Ohio in sod are very emphatically benefited by nitrate of soda, and the Michigan Agricultural College is piling up evidence in confirmation of the Ohio work.

The Woburn Experiment Station in England, in a series of very unique experiments, has proven that the roots of grasses give off a substance that is poisonous to apple trees, at least to the extent that it makes the foliage yellow and retards growth. But this toxic material is oxidized if it comes in contact with the air and is then no longer detrimental to apple trees.

Chemists know that nitrate of soda is a very powerful oxidizing agent and without doubt would destroy any organic material in June grass sod that the oxygen of the air would destroy.

The above four facts do not contradict each other. On the other hand, they make clear what would otherwise appear to be a contradiction. In England they oxidize the toxic material from June grass by letting the water leaching from the sod rain through air before coming in contact with the apple roots, and thereby oxidize the detrimental material. In Ohio and Michigan they oxidize it with nitrate of soda, converting it into nitrate of soda, which does not detract from its fertilizing value. This nitrate produces a heavy growth of grasses that add to the organic matter in the soil, which is an undoubted advantage on poor soils.

We know of no experiments that show that nitrate of soda is beneficial when no grasses are in the orchard, and there are many experiments in New York that show that it is not beneficial. The above explanation would therefore appear to harmonize what has usually been considered contradictory evidence, and no one will question the very great need that exists for co-ordinating and harmonizing the results of the immense amount of labor and expense that has already been incurred and that is causing still further waste of dollars by fruit growers who are governing their actions by one set of experiments or another without a full knowledge of the facts entering into the case.

H. H. D.

Member: Have you ever tried growing young trees in sod in connection with nitrate?

Cruickshank: We are able to grow young trees in sod if nitrated.

Ballard: In regard to June grass I want to say that we have had a Duchess orchard in sod for thirty-five years and they have been yielding good. Has the application of sulphate a tendency to sour the soil?

Cruickshank: We have not been using sulphate of ammonia very long in orchards. Experiment with field crops show an accumulation of acidity. If used year after year, enough lime to counteract the acidity will probably have to be used. This would require perhaps a thousand pounds to the acre every five years.

RESULTS OF ORCHARD FERTILIZATION IN W. F. FARRAND ORCHARDS, EATON RAPIDS.

PROF. ROY E. MARSHALL, M. A. C.

In the Spring of 1920 a fertilizer experiment consisting of five plots of eighteen trees each was initiated in the Ben Davis orchard of W. F. Farrand about one-half mile east of Eaton Rapids. This orchard is about thirty-five years old and is growing on a piece of practically level land. The soil is very light in character and was in a very low state of fertility. The orchard is growing in a sparse blue-grass sod. It had been neglected so far as pruning and cultural practices are concerned for several years; consequently the trees were in a very poor state of vigor, had many dead and weak branches and twig growth and the yields were low.

The five plots were treated as follows:

Plot 1. Sulphate of ammonia, 4 lbs. per tree
Plot 2. Nitrate of soda, 5 lbs. per tree
Plot 3. Check, no fertilizer
Plot 4. Acid Phosphate 10 lbs. per tree
Plot 5. Sulphate of Ammonia, 4 lbs. per tree
Acid Phosphate, 5 lbs. per tree
Muriate of potash, 3 lbs. per tree.

These fertilizers were broadcasted under the spread of the branches some two or three weeks after the blossoms fell—too late to accomplish the best results for that year. The orchard received early sprays in 1920 but the later ones were omitted because the orchard failed to set sufficient

fruit to warrant further expense. The yields for 1920 were negligible. There were no apparent differences between plots in any respect during that season, except in the grass growths which was better in the plots receiving nitrogen.

Unfortunately, a plot with a combination of nitrogen and acid phosphate (a combination that has frequently proven the most profitable in orchards of other sections) was not included in the original project. Realizing the need for testing such a combination, these materials were applied to the balance of the orchard in the spring of 1921 at the rate of 4 lbs. of sulphate and 10 lbs. of acid phosphate per tree.

The other plots received the same treatment in 1921 as in 1920, except the fertilizers were applied about a week before blossoming. Since an earlier attempt had not been made to prune the trees, a very light pruning was given them shortly after the blossoms fell. This pruning consisted in the removal of dead, broken and much weakened branches and twigs and a very light thinning of some of the smaller branches about outer parts of the trees.

The orchard was dusted four times, the duster being driven crosswise of the plots.

Before launching into a discussion of the results perhaps we should make a study of moisture conditions. Residents of Eaton Rapids and vicinity complained throughout the past season of the low amount of precipitation for that immediate section compared with the rainfall for adjacent sections. It was an exceedingly dry period during the earlier part of the summer and crops suffered considerably. Unfortunately for our purposes, the closest weather bureau station is at Charlotte, about ten miles distant. The rainfall at Charlotte is thought to have been heavier than at Eaton Rapids. For comparison the rainfall at East Lansing, where there was plenty of moisture except for late spring or very early summer, and Charlotte are given for five months:

Month	Charlotte	East Lansing	Deficiency
April	3.3	3.8	.5
May	1.3	1.33	.03
June	1.49	3.24	1.75
July	.95	2.61	1.66
August	4.12	5.18	1.06

The big differences occur for June, July and August, but the rainfall for both stations was very low for May, thus giving Charlotte four dry months. Charlotte had five inches less rainfall than East Lansing during the five months. It is thus evident that Eaton Rapids had a low rainfall for the growing season.

Mr. T. A. Farrand reports no noticeable differences in the number of blossoms produced by trees of the several tree plots. The trees blossomed heavily but the late frost considerably reduced the set of fruit for the orchard as a whole.

In making observations during the early portion of the season, it appeared that all plots receiving fertilizer had set heavier crops than the check, but there were not apparent differences between the fertilizer plots. However, in checking up the yield results at the end of the season, there appeared to be three distinct percentages of set, although an actual count of apples borne by the trees was not made. Plots receiving nitro-

gen alone set very much heavier crops than the check, but apparently not quite as heavy as phosphate plots. I think these statements will be borne out later when yield data is presented. If phosphorus has been responsible for increasing the set this will be the first recorded case that I know of.

Throughout the past season there were distinct differences between the foliage of the various plots. The leaves of all plots receiving nitrogen alone or in combination, or of all plots except the check and acid phosphate ones, were more numerous, larger and decidedly darker green in color. The trees of the complete fertilizer, the sulphate of ammonia and nitrate of soda plots were dense and one could not easily see through them while the acid phosphate and check plot trees were open and had sparse, light green foliage.

Differences in growth were recognized early in the season and became more marked as the season advanced. During the last week in August, twigs representative of the longer growths of each plot were collected and mounted to show differences of growth. These may be seen in the room adjacent to this one. The average length of these twigs are as follows:

Sulphate of ammonia	8 inches
Nitrate of soda	6.5 inches
Check	2.9 inches
Acid phosphate	2.9 inches
Complete fertilizer	9.8 inches
Acid phosphate and sulphate of ammonia (1 yr.)	5.1 inches

It is noted that all plots receiving nitrogen gave decidedly increased twig growth. Phosphorus may have been responsible for some of the increased growth in combination plots. Its failure to produce increased growth where used singly may be due to its inability to give such response or to the fact that the heavier setting of fruit taxed the trees to their capacity and that yield was at the expense of twig growth.

Dust failed to hold the scab in check in this orchard for some unknown reason and this affords an excellent opportunity to compare plots for disease resistance. Fortunately the duster was driven cross-wise of the plots at each application and there appears no reason why one plot should not have produced as clean fruit as another, barring the effects of fertilizers.

During early summer it was noticed that the fruit in the complete fertilizer plot had less scab than the orchard as a whole. Closer observation throughout the season and during harvest showed marked differences between the complete fertilizer plot on the one hand and the check and acid phosphate plots on the other. It would seem then that in this orchard stimulation by fertilization has aided in controlling scab or has made the fruit more resistant to disease attacks.

The fruit was handpicked, run over a Gifford Sizer to get an idea as to the effect of fertilizers in influencing size of fruits and then weighed. The fruit was sized into four grades: less than two inches, two to two and one-fourth inches, two and one-fourth to two and one-half inches, and larger than two and one-half inches. For our purposes we will combine the first two sizes. The average yield of handpicked apples in pounds per tree is given below.

	Less 2¼″	2¼-2½″	Over 2½″	Total
Sulphate of ammonia	5.5	43.4	184.7	233.6
Nitrate of soda	5.3	43.4	152.5	201.2
Check	3.9	25.1	31.1	60.1
Acid phosphate	35.4	91.2	82.8	209.4
Complete fertilizer	11.1	103.7	288.2	403.0
Nitrogen and phosphorus (1 yr.)	3.3	90.	191.5	299.2

The yields from the two nitrogen plots and the acid phosphate plot may be considered practically the same as the differences are not greater than one might naturally expect had these three plots been given the same treatment. They have yielded about three and one-half times as much as the check; while the nitrate-phosphate plot, receiving fertilizer only one year has produced about five times as much as the check and the complete fertilizer plot has produced about seven times as much.

Evidently nitrogen and phosphorus are of about equal value in producing yields in this orchard but should be combined to produce the most satisfactory results. We have no way of knowing whether the potash in the complete fertilizer plot was responsible for any gains in that plot. It would seem though if the nitrate-phosphate plot had been fertilized two years that a larger yield might have been expected and that this would leave little differences between the yields of this plot and the complete fertilizer one.

This is the first time (in observations covering seven or eight years) that I have been in intimate touch with an experiment or even a demonstration where acid phosphate has been responsible for decided increases in yield when used alone. Quite commonly, a nitrate-phosphate combination will greatly outyield nitrogen alone, but seldom has phosphorus been definitely known to give such results as are here recorded.

The percentage of fruit of each grade for each of the plots more clearly shows differences between plots and is here presented.

	Less 2¼″	2¼ to 2½″	Over 2½″
Sulphate of ammonia	2.3%	18.6%	79.1%
Nitrate of soda	2.6	21.5	75.8
Check	6.5	41.7	51.8
Acid phosphate	16.9	43.6	39.5
Complete fertilizer	2.7	25.6	71.6
Nitrogen and phosphorus(1 yr.)	5.9	30.1	64.0

71% to 79% of the fruit in the plots receiving nitrogen for two years grew to sizes two and one-half inches or larger and less than 3% of the fruit from any of these plots was too small for a No. 2 or B grade, in spite of the low rainfall. Slightly over one-half of the fruit from the check plot was large enough for a No. 1 or A grade. The acid phosphate plot produced smaller fruit than any other plot. Less than 40% of it was large enough for A grade, and 17% or more than one-sixth of it was too small for a No. 2 or B grade.

This again shows that phosphorus plot set a good crop of fruit, but the acid phosphate evidently did not supply the necessary stimulus to grow as many fruits to full size. I feel certain that the addition of nitrogen to this plot would have stimulated growth of these fruits resulting in much larger total yields and especially larger yields of apples above two and one-half inches in size.

The fruits from the several plots were not graded for color, but the almost solid red Ben Davis apples of the acid phosphate plot were in strong contrast to the fruit of other plots between which there was no noticeable differences. You will readily note the differences when you see the fruits in the adjacent room. Whether this increased color is due directly to acid phosphate or indirectly because acid phosphate failed to produce satisfactory foliage is questionable.

The average weight of windfalls and "drop" apples per tree from each plot and the percentage of "drops" is expressed for each plot in the following tabulation:

	Lbs. Drops	Per cent of Total Fruit
Sulphate of ammonia	59.6	20.3%
Nitrate of soda	44.3	18
Check	25.8	30
Acid phosphate	72.5	25.5
Complete fertilizer	64.6	13.8
Nitrogen and phosphorus (1 yr.)	64.3	17.7

The percentage of drops for the check plot is more than two times that for the complete fertilizer plot. The acid phosphate plot ranks second highest in percentage of drops and the two nitrogen plots ran about the same.

The costs and profits for the several elements and combinations of fertilizers, above those of the check plot, are shown in the following tabulation. Fertilizer for both 1920 and 1921 is charged against the crop because of the crop failure in 1920.

Fertilizer Mixture per tree.	Net yield above check per tree.	Value at $2.25 cwt.	Cost of fertilizer	Profit per tree.	Profit per acre.	Lbs. fert. to produce 100 lbs. apples.	Cost of apples per 100 lbs.
4 lb Sulphate of ammonia	173.5	$3.90	28c	$3.62	$173	4.6	16.1c
5 lb Nitrate of soda	141.1	3.17	30c	2.87	138	7.1	21.3c
10 lb Acid phosphate	149.3	3.35	25c	3.10	149	13.4	16.8c
4 lb Sulphate of ammonia 10 lb Acid phosphate 3 lb Muriate potash	342.9	7.72	71c	7.01	336	9.9	20.6c
4 lb Sulphate of Ammonia 10 lb Acid phosphate	239.1	5.37	27c	5.10	245	5.9	11.2c

The following prices were used in computing above:

Apples, on trees, per cwt	$ 2.25
Sulphate of ammonia	70.00
Nitrate of soda	60.00
Muriate of potash	60.00
Acid phosphate	25.00

The complete fertilizer plot produced almost two times as much profit per tree as the sulphate of ammonia plot (which slightly excelled the nitrate of soda and acid phosphate plots) but the increase in yield due to fertilization was produced about 20% cheaper in the sulphate of ammonia plot. The very low cost of increased production for the sulphate of ammonia-acid phosphate combination is largely because ferti-

lizer has been applied to these trees one season while the other plots had two applications.

One-half of each plot received ground limestone at the rate of two tons per acre in the spring of 1920 but it has failed to produce increased yields over the unlimed plots. Furthermore, there have been no indications so far that the lime has produced any beneficial results.

It must be borne in mind that the soils of Michigan are very variable and I would not like you to infer that these results can be duplicated in your orchards. Furthermore, these results are based upon one year's crop and I anticipate that further crops will give us fully as interesting but somewhat different results. For instance, I am inclined to think that the acid phosphate plot is in such a devitalized condition after trying to mature a heavy setting of apples that little can be expected of it next year.

The Horticultural Department is carrying on fertilizer tests, on a less extensive scale, in all parts of Michigan and some of these tests are to be reported upon here this afternoon. It is only through a thorough study of all these tests and especially those carried on in orchards grown under conditions similar to yours, that you can determine what is best for your orchards. I would encourage you to make tests of these fertilizers on small plots of trees in your orchards to more definitely determine their needs.

We do feel safe, however, basing our judgment on results of this and other experiments in Michigan and other states, in recommending a combination of nitrogen and acid phosphate. The amounts to apply will depend upon whether the orchard is in sod or under cultivation, the condition of the soil, the age of the trees, the vigor of the trees as indicated by twig growth, the activity of the fruit spurs, the set of fruit, the color, size and amount of foliage, and the yield of fruit.

Chairman Hawley then gave the members of the Society an opportunity to ask questions and they were answered by Professor Marshall as follows:

Mr. Cowen: Has the application of nitrogenous materials on winter apples any effect on the keeping qualities?

Mr. Marshall: I know of apples that have kept just as well as apples that have not received the applications of fertilizing materials. Have known of them being kept as long as June, which is plenty long enough when you consider the cost of storage.

Mr. Rogers: I would like information regarding my new orchard of Baldwins, Jonathans, and Hubbardsons. The Baldwins' growth is very slow; some seem to be standing still.

Mr. Marshall: The application of nitrate of soda will make them grow if anything will. Perhaps some local grower could help you more with problem, however.

Question: Will nitrate of soda make any difference in the color of the fruit?

Mr. Marshall: The application of this material will lighten the color somewhat. It produces more foliage and this keeps some of the sunlight away from the fruit, and the color will not be as good as in an unfertilized orchard. That is one of the prices we expect to have to pay.

Mr. Hutchins: Would the variety make any difference in the size?

Mr. Marshall: These apples were all one variety.

RESULTS OF ORCHARD FERTILIZATION DEMONSTRATIONS OF HORTICULTURAL DEPARTMENT IN BERRIEN COUNTY.

F. L. SIMANTON, COUNTY AGENT, ST. JOSEPH, MICHIGAN.

The fertilizing work in Berrien County that I wish to speak of was started in 1920 and 1921. In order to consider the results I think I should say something of the weather conditions we had during those two years. In 1920 our weather was peculiar. The moisture film in our soil broke very early and so we had very little feeding of the roots of trees and small fruits after the early part of the season. The experiment work was started in co-operation with the Extension Service Department and various citizens of Berrien County. For some reason the Extension Service people had difficulty in getting the materials on the ground, and it was June before we had them to use. This was entirely too late to produce any great effect on the 1920 crop. At that time the moisture was so far out of the ground that there was no possibility of the roots feeding upon it. We conducted experiments, in cooperation with other parties, using sulphate of ammonia on fruits and other crops and secured data to cross check with.

Almost without exception we received no response from fertilizers in 1920 until the fall rains set in. Potato growers got in trouble on account of the delayed action. We did, however, get good results the following year. The first experiment was with blackcap raspberries. We had four plats on rather poor, sandy loam soil. The first plat received nitrate of soda; the second, nitrate of soda, acid phosphate and potash; the third, nitrate of soda and phosphate; the fourth being a check. Under conditions the first year no results appeared. I may say with reference to raspberries, both black and red, that we have three or four projects started this year, which to date tally the same. We can see very little effect from the fertilizers applied this year.

In the Spring of 1921 we had weather conditions that were moist in the early part of the season, suitable for growth, and then came on, about the time the fruits ripen, the intensely dry weather. The plants soon began to show very decided distress. The unfertilized plats were yellow and sickly in color. The others were a healthy green. One man, using nitrogen, phosphorus and potash, thought he had the best field of blackcaps in the country. The data was collected by the owner and I will give it to you just as he gave it to me.

Complete fertilizer—67 quarts.
Nitrogen and phosphorus—67 quarts.
Nitrate alone—76½ quarts.
Check—47½ quarts.

It is hard to explain why the nitrate alone should get more than the chemical combinations. However, I have known of cases where chemicals were applied but not needed, and they acted as poisons.

We treated an old orchard of Kings and Baldwins, probably thirty-five years old, where the ground was very dry and the roots were feeding very deep. The result was not great the first year, but the orchard is in condition to produce results in another year.

Another experiment was in Mr. Ballard's orchard, at Niles, where the inner space is filled with alfalfa. Can see very little progress as yet.

Referring to our dewberry experiments. Near Riverside, we have an experiment using sulphate of ammonia with acid phosphate. The vines in response to this treatment grew from six to twelve feet long and very thick. The foliage was exceptionally large and green. We have very good prospects for another year. There was a plat that received no treatment and the vines in this instance grew from two to five feet long and the yield was about half as great. The vines were fourteen years old and were on a sandy soil where the food elements had been exhausted. They are using nitrogenous material to very good advantage; also acid phosphate.

We used these materials on grapes. The first year the material was received too late for us to get any benefit. Last year there was not enough soil moisture in the ground to dissolve the chemicals to a working point but later on the vines were able to take advantage of the applications. The response has been rather discouraging this year, but the vines are in good condition, for another year. One set of the plats received a cover crop as a part of the fertilizing phenomena.

We applied it to other crops, but some of the work had to be abandoned on account of the farmer being unable to use his tractor, but the results on fruit that I have seen are reliable cases.

RESULTS OF ORCHARD FERTILIZATION DEMONSTRATIONS OF THE HORTICULTURAL DEPARTMENT IN BENZIE COUNTY.

J. L. KRAKER, COUNTY AGENT, BEULAH.

In May, 1920, arrangements were made for the demonstrations of the use of fertilizers in Benzie County, tests being outlined on cherries on the farm of Ward Reynolds, near Benzonia; apples on the farm of W. R. Thomas, Crystal Lake township; peaches on the farm of A. J. Rogers, Lake township. In April, 1921, the same trees which had received fertilizer in 1920 were again fertilized, and additional tests started on pears on the farm of Wallace Putney, Blaine township, and on blackberries on the farm of H. L. Keller, Gilmore township. In addition to these controlled tests, several farmers of the county purchased small amounts of ammonium sulphate for testing out on their own farms around fruit trees. The writer has not talked with one of these men but who is entirely satisfied with the use of fertilizer on trees—they all expect to use more next year and there are many of their neighbors who have already spoken for ammonium sulphate to be used on fruit trees in 1922. In this connection it is to be noted that the results given below are merely indicative of what may be expected from the use of fertilizer, and we expect to continue this work in co-operation with the Horticultural Department of the Michigan Agricultural College for several years, and applications will again be put on these trees in 1922.

The block of cherry trees fertilized is situated in Benzonia, west of Spence's blacksmith shop. This is a uniform block of Montmorency cherry trees seven years old. Ten trees were fertilized in each of three rows, leaving another row along side without fertilizer as a check. Row No. 1 had 3 lbs. of nitrate of soda per tree; row 2, 3 lbs. nitrate of soda

and 5 lbs. of acid phosphate; row 3, 3 lbs. of nitrate of soda and 5 lbs. of acid phosphate and 1½ lbs. of muriate of potash. Row 1 was the check row and was unfertilized. This orchard was hit by a frost while in blossom, and therefore the yield is not as high as it should be. However, the value of the fertilizer was very clearly shown, for the ten trees that were fertilized with nitrogen alone on row 1 yielded an average of 14½ lbs. per tree; row 2, fertilized with nitrogen and acid phosphate averaged 19½ lbs. per tree; on row 3, with all three fertilizing ingredients, the average was 11 lbs. per tree. The check row averaged 8½ lbs. of cherries per tree. These results gave such a tremendous difference in the favor of fertilizer that 10 other trees were selected in another part of the orchard which had received no fertilizer, and the difference of 7½ lbs. of cherries in favor of those trees fertilized with 3 lbs. of nitrate of soda and 5 lbs. of acid phosphate. From these results it will be seen that both the nitrogen and the acid phosphate seem to help the yield of cherries, but when a complete balanced fertilizer was applied around the trees, they do not respond as they do when the potash is omitted. This indicates that there is an abundance of potash in the soil, but that nitrogen and phosphoric aid has both helped the yield of cherry trees in this particular orchard. The soil of this orchard is typically sandy loam on which most of our cherries are planted in Benzie County and it had also been fertilized, and it appears from these results that nitrogen and possibly acid phosphate are needed for efficient cherry production.

Carrying these results into dollars and cent figures we find that the nitrogen and acid phosphate applied cost 17c per tree. With trees planted 20x20 feet apart, there are 108 per acre making a total cost of $18.36 for the fertilizer per acre. Allowing $3.00 for labor in application of the material, the total cost is about $22.00 per acre for this fertilizer. Multiplying 7½ lbs. average gain per tree by 108 trees we have a gain of 810 lbs. of cherries. The cherries from this orchard were sold through the cherry pool of the Benzie County Farm Bureau this year and netted 10c per lb.—that is they sold for $81.00. Subtract $22.00 the cost of the fertilizer from this $81.00 per acre we have a net profit of $59.00 on Montmorency cherry trees under the conditions as we found them in the Reynold's orchard.

The results obtained on apple trees are even more striking than those obtained from the cherries. The trees treated were twenty-six year old Wealthy and Pewaukee trees. Where 5 lbs. of nitrate of soda was applied, the average yield was 5½ bushels of apples. Where 5 lbs. nitrate of soda and 10 lbs. of acid phosphate were applied 10¼ bushels of apples were obtained, and where 5 lbs. of nitrate of soda, 10 lbs. of acid phosphate and 2 lbs. of potash were applied 10 bushels of apples were harvested per tree. On the check trees, to which no fertilizer had been applied, an average of 3½ bushels of apples were obtained. This makes a clear gain of 6½ bushels of apples on the trees where nitrate of soda and acid phosphate and the complete fertilizer were applied. Here again we do not seem to have any results from the potash, but do have results from the nitrate of soda and acid phosphate.

Figuring our apple gain, we find that the cost of nitrate of soda and acid phosphate to be 31c per tree. The trees were planted 40x40 feet apart, 27 trees to the acre, making the total cost of the fertilizing ma-

terials $8.37 per acre. Again allowing $3.00 for the cost of applying the fertilizer, we have a cost of say $11.50 per acre. Our figures show that we have a gain of 6½ bushels per tree, which when multiplied by the number of trees per acre or 27 gives 175 bushels as the gain per acre. $1.00 per bushel conservative figure at which to place the selling price of apples this year, and a gross gain of $175.00 per acre results. Deducting the cost of the fertilizer, a net gain of $163.50 is shown this year.

On the Pewaukee trees, a very important fact was noted. Pewaukees are notoriously off-year bearers, that is, they bear one year and rest the next unless some climatic conditions force them into bearing two years in succession. This has evidently happened in the Thomas orchard at one time, for some of these trees had a crop in 1920, while others were practically bare. One would naturally expect those trees which bore heavily in 1920 to be vacant this year. However, it was these trees on which fertilizer had been applied. We find from the use of 5 lbs. of nitrate of soda and 10 lbs. of acid phosphate that these trees which should not have borne any apples this year had an average of 10 bushels of apples, whereas, the trees along side, with which 1921 was an onbearing year, produced 19 bushels per tree. There seems no other factor to attribute the fact that the off year trees gave 10 bushels each of apples this year except that they had received a stimulus last year by the application of fertilizer to set fruit buds which functioned this year. This is another very important reason why trees need fertilizer.

The Elberta peach orchard on the Rogers' farm is on light sandy soil and is a uniform stand of peaches planted in 1911, but because of having lost two years of their life due to the freeze in 1919, we figure these trees as being eight years old. In this test ten trees were taken to which fertilizer was applied in each series, and a guard row on which no fertilizer was applied, and from which no results were taken were left between each row. Therefore, there could be no chance of the fertilizer from the adjoining row being used by trees under test alongside of it and making the results of the test unreliable. The average yield of the 10 trees where 2½ lbs. of nitrate of soda was applied per tree was 1½ bushels of peaches per tree; on the row that had 2½ lbs. of nitrate of soda and 5 lbs. of acid phosphate per tree, an average of 1.4 bushels was obtained per tree; and where 2½ lbs. of nitrate of soda, 5 lbs. of phosphate and 1 lb. of muriate of potash was applied, slightly more than 1½ bushels of peaches were obtained. As in the cherry and apple test, the check peach trees which received no fertilizer did not produce as much fruit as was obtained where fertilizer was used, only ¾ of a bushel of peaches being the average of this row of trees. From these results it was seen that the nitrogen seems to be the determining factor, and it is recommended that nitrogen alone, either in the form of nitrate of soda or ammonium sulphate be used on peaches.

The cost of the nitrogen per tree is 9c. Figuring 108 trees per acre gives a cost of $9.72 for the fertilizer, and allowing $3.00 labor cost for the application of material gives the total cost of application of $12.72 per acre for this fertilizer. Three-fourths of a bushel is the gain per tree with the use of fertilizer and when multiplied by 108 trees per acre gives a gain of 81 bushels per acre. $1.50 per bushel is a conservative selling price for peaches in 1921, making a total of $121.40 gross gain, or deducting the cost of fertilizer, making a net gain of about $108.68 per acre.

The figures given above are the actual results that we obtained from the use of fertilizer in Benzie county the past year. We need more figures such as these before we can definitely adopt the use of fertilizers in our orchard practice of growing fruit, but these results are so striking that it would seem that every farmer in Benzie County should use nitrogen and perhaps acid phosphates on every fruit tree which he is growing, and if the results are any where near like these recorded, here, it will be a paying proposition. In addition to the increased production of fruit, the trees on which the fertilizer was applied are more vigorous, retain a more healthy green color, hold their leaves longer and grow better than the check trees. Those trees on which the fertilizer had been applied have set a large number of fruit buds for another year, and with their increased vigor bid fair to mature more of these buds than the unfertilized check trees.

RESULTS OF FERTILIZATION DEMONSTRATIONS OF HORTICULTURAL DEPARTMENT IN ALLEGAN COUNTY.

ALFRED BENTALL, COUNTY AGENT, ALLEGAN.

I am going to be very brief because there isn't much to be said. I want to speak, however, of some of the experiments we are carrying on in Allegan County, both with the growers and with the Horticultural Department of the College. I will speak first of one on the Abbott farm where we have Wealthy trees being fertilized with five pounds each of nitrate of soda, sulphate of ammonia, and acid phosphate, and some with two pounds of potash. We are unable to see any benefit from the addition of the potash. We also used these materials on two or three kinds of plums and cherries and cannot credit the potash with anything. Neither can we see anything that can be credited to the acid phosphate. If there is any difference in the rows of trees where the phosphate was used we are unable to see it. We could, however, see a difference where the nitrates were used. The foliage was much denser. In fact, the trees were ten days late in bearing and the fruit did not have nearly so good a color. The trees had a large crop and had many fruit buds for next year. There are not nearly so many on the unfertilized trees. We found the cherry and peach trees in the same condition, with denser foliage and with larger and firmer fruit and more fruit buds for next year.

The difference is very marked in Mr. Wadsworth's orchard. We applied the second application to part of his orchard this year and he wants it on all of his trees another year. We had a demonstration on a crabapple orchard, twenty or more years old, which hasn't looked right for several years. The trees were doing fairly well, but they looked yellow. The land was good—the adjoining field had a good growth of clover and alfalfa. This field was given an application of acid phosphate and in addition each tree was given an application of sulphate of ammonia. The difference was remarkable. The bark of the unfertilized trees was very much lighter. This is most conclusive evidence to me because this orchard has been a conundrum to use for some time. There are scores of growers in Allegan County who can tell you much more than I can.

We have heard some about manure this afternoon. There is no such thing as running a farm without commercial fertilizers. A general farm cannot produce enough manure to take care of all the land. Two years ago we had two large Spy trees that looked half dead. We used manure on these trees trenching it in. Mr. Pickford suggested that he plow two furrows each side, put the manure in, and then plow the ground back over it. The difference is readily seen today. They are full of fruit buds for next year, although they have not borne for twelve years.

I believe the next five years is going to show an increase in the growing of alfalfa in the orchard. Mr. Hawley states this topic is coming up for consideration at a later session so I will leave the matter until that time.

RESULTS OF ORCHARD FERTILIZATION DEMONSTRATIONS OF HORTICULTURAL DEPARTMENTS IN VAN BUREN COUNTY.

W. C. ECKARD, COUNTY AGENT, PAW PAW.

Notes on Fertilizer Demonstration on Apples at farm of M. S. Russell' Bangor, 1920-1921.

CROP OF 1921 IS GIVEN.

Comparing the average yield per tree of check rows 1 and 4 with the average yield per tree of rows 2 and 3 which received for two years, five pounds of nitrate of soda per tree per year or 38 cents worth during the two years, with nitrate of soda at $76.00 per ton, we find $6.10 worth of apples per tree more from the fertilized trees than from the unfertilized, when the apples are valued at $1.00 per bushel, at the cost of 38 cents per tree. In other words, 38 cents expended on nitrate of soda returned $5.72 per tree above the cost of the material.

Comparing the average yield of check rows 4 and 7 with yield of rows 5 and 6 which received during the two years, 10 pounds of nitrate of soda and 20 pounds of acid phosphate per tree at a cost of 63 cents, we find that the increase in yield at $1.00 per bushel brought $3.20 per tree or $2.57 per tree less the cost of the fertilizer.

Comparing check row 7 with rows 8 and 9 which, during the two years, received 77 cents worth of nitrate of soda, acid phosphate and muriate of potash per tree, we find the increase in yield when sold at $1.00 per bushel returned $3.60 per tree or $2.83 per tree less the cost of the fertilizer.

Data on Fertilizer Demonstrations on Old Apple Trees at the Farm of Mr. M. S. Russell, Bangor, Michigan, 1920-1921.

CROP OF 1921 IS GIVEN.

Row	Treatment 1920 per tree	Treatment 1921 per tree	Cost per year per tree	Cost two years per tree	Total No. trees	Total yield in bushels	Yield per tree in bushels	Value per tree @ $1 per bu.
1	0	0	0	0	5	57	11.4	$11.40
2, 3	5lb N. of S.	5lb N. of S.	19c	38c	10	167	16.7	16.70
4	0	0	0	0	5	49	9.8	9.80
	5lb N. of S.	5lb N. of S.						
5, 6	10lb Acid P.	10lb Acid P.	31.5c	63c	10	139	13.9	13.90
7	0	0	0	0	5	58	11.6	11.60
	5lb N. of S.	5lb N. of S.						
	10lb Acid P.	10lb Acid P.						
	2lb Muriate	2lb Muriate						
8, 9	of Potash	of Potash	38.5c	77c	10	152	15.2	15.20

Nitrate of soda at $76 00 per ton.
Acid phosphate at $25 00 per ton.
Muriate of potash at $70 00 per ton.
All fertilizer was applied on April 23rd in 1920 and on April 12th in 1921.

Notes on Fertilizer Demonstration on Peaches at Edward Skinner's at Hartford, 1920-1921.

CROP OF 1921 IS GIVEN.

Comparing the average yield per tree of guard rows No. 1 and 4 with the average yield of trees on rows 2 and 3 which received during the two years, six pounds of nitrate of soda per tree at a cost of 15 cents, we find the increase in yield when sold at $3.00 per bushel returned $2.62 per tree or $2.47 per tree less the cost of the fertilizer.

Comparing the average yield of all trees in all guard rows and in the check row with the average yield per tree of trees in rows 2 and 3 we find the increase in yield, at $3.00 per bushel, returned $2.21 per tree or $2.06 per tree less the cost of the fertilizer.

Comparing the trees on rows 5 and 6 with the average of guard rows 4 and 7 we find the increase yield per tree returned $2.17 or $2.02 per tree less the cost of the fertilizer.

Data on Fertilizer Demonstrations with peaches at Edward Skinner's, Hartford, 1920-1921.

YIELD OF FRUIT FOR THE YEAR 1921 IS GIVEN.

Row	Treatment 1920 per tree	Treatment 1921 per tree	Cost per year per tree	Cost two years per tree	Total No. trees	Total yield in pounds	Yield in pounds per tree.	Value per tree @ $3 per bu.
1	0	0	.076	.152	10	681.5	68.15	4.089
2, 3	3lb N. of S.	3lb N. of S.	0	0	4	49½	12.37	.7422
4	0	0	0	0	3	109½	36.5	2.19
	3lb N. of S.	3lb N. of S.						
5, 6	5lb Acid P.	5lb Acid P.	.1385	.277	8	627	78.3	4.698
7	0	0	0	0	5	239	47.8	2.858
8	0	0	0	0	3	101	33.66	2.0196
9	0	0	0	0	5	206.5	41.3	2.478
	3lb N. of S.	3lb N. of S.						
	5lb Acid P.	5lb Acid P.						
	2lb Muriate	2lb Muriate						
10, 11	of Potash	of Potash	.2085	.417	10	674	67.4	4.04
12	0	0	0	0	5	78	13.6	.816

Nitrate of soda at $76.00 per ton.

Acid phosphate at $25.00 per ton.

Muriate of potash at $70.00 per ton.

All fertilizer was applied on June 25th in 1920 and on April 12th in 1921.

In conclusion I would like to state that in my opinion there are a great many problems in connection with the matter of fertilizers on fruit trees and plants which need solving.

There is a fertile field for the Experiment Station of the Michigan Agricultural College along this line.

In the meantime, I feel like saying, as I said at the mid-winter meeting of the State Horticultural Society held in South Haven, in 1918, that a larger per cent of the fruit trees in Vam Buren County are actually slowly starving to death and nearly all are but poorly nourished. Also, that I still believe that the first and most important step in working out a practical system of properly feeding our starving trees is to lime the soil heavily to be able to grow legumes in the orchard and this, whether the fruit grower be a cultivation cover crop man or a mulch advocate.

I believe that we will find that not only will it pay big to feed our trees with fertilizers but that it will also pay to feed the cover or mulch crop well.

If legumes are used as a cover crop or mulch crop it will be advisable to use only acid phosphate and muriate of potash separately or in combination directly on the cover crop but if non-legume plants, such as rye or June grass are used, by all means nitrate of soda or sulphate of ammonia should be used.

One point which I consider especially important in using soluble nitrogen, such as nitrate of soda or sulphate of ammonia, is to apply it only at such times as the trees or plants can quickly take it up, there may be danger of losing considerable of the fertilizer if there are not growing plants or trees ready to take it up as soon as it dissolves in the soil water.

DECEMBER 7, 1921.

FORENOON.

After a judging contest in which some twelve or fifteen Juniors and Seniors of the Michigan Agricultural College participated, the meeting in charge of Mr. Rogers opened with the Speakers' Contest.

Mr. J. D. Wilson of Lansing was the first speaker.

BRAMBLE DISEASES OF MICHIGAN AND THEIR CONTROL.

J. D. WILSON, LANSING, MICH.

The term brambles includes several small fruits. In this discussion it will be confined to raspberries and blackberries.

The principal diseases of brambles in Michigan are,—anthracnose, cane blight, crown gall, orange rust and yellows. Anthracnose and cane blight cause their greatest damage to the black raspberry. Yellows is a disease of red raspberries and orange rust attacks the blackberry. Crown gall (a bacterial disease) infects many fruits.

Most of the diseases of brambles live over winter in the old canes and rubbish about the berry patch. This fact suggests an important possibility. Why not cut out the old canes and burn them with the rubbish in the fall? As it happens, this is the best means of keeping most of the diseases down to a minimum of infection. There is one exception to this, anthracnose can be very well controlled by the use of lime sulphur. With the other bramble diseases mentioned, spraying is strangely inefficient.

Raspberry anthracnose, caused by Pectodisela veneta, occurs almost universally where raspberries are grown. It is most serious on the black cap. In dry seasons an almost complete loss of the crop may be experienced. It often makes the renewal of the plantation necessary every three or four years.

The vegetative portion of the fungus lives over the winter in the old canes. Spores are produced in the spring which cause re-infection of the young canes when they are from six to eight inches high. Purple spots appear on the shoots, later these spots enlarge and the center becomes grey and shrunken. The midribs of the leaves and the fruit are often infected.

By spraying with lime sulphur before the infection occurs, many of the spores may be killed when they germinate. A dormant application (1-20) gave commercial control in experiments this year. By putting on a second and third spray of 1-50, complete control may be obtained. The second spray should go on when the new shoots are from six to ten inches high, the third about two weeks before the canes bloom. If, for any reason, it is suspected that control is not complete, the canes should be carefully gone over after the fruit has been harvested and all of the infected material removed and burned.

Cane blight, caused by Letoshaeria coniothyrium, is another serious disease of black caps. It occurs over most of the Eastern U. S. It is peculiar in that it causes the greatest loss in dry seasons when one-half to one-third of the crop may be lost. Very often the first sign of this disease, which the grower notices, is a sudden wilting of the canes. The

fungus lives over the winter in the old canes. Spores are produced in the early spring. These cause infection at any point of injury on the cane. Wounds caused by the cutting back of canes and those of the tree cricket are open avenues of entrance for the spores. The diseased area gradually enlarges until it encircles the cane. When this girdling is complete the water supply is shut off and the cane wilts quickly above the place of attack. The bark becomes light colored and the wood dead and brittle in the diseased area. The berries are often affected with dry rot.

The fungus has been known to live for four years in the old canes and trash about the berry patch. The old canes should be removed soon after fruiting and destroyed. Secure healthy plants for starting new plantations. Be careful to avoid excessive wounding of the canes in the operations about them.

Crown gall is caused by bacteria and is very common on fruit plants. It causes great loss when considered in the aggregate. It may be identified on the brambles by an enlargement near the junction of the cane and root.

Use healthy plants for new plantations and set them on soil which has not had any infection for a period of several years. Remove any diseased plants that may be found at any time and destroy them.

Orange rust is primarily a disease of the blackberry. Early in May small spots appear on the leaves, somewhat later these spots enlarge and burst. Great quantities of orange colored spores are freed, their color giving the disease its name. The leaves remain small and appear blistered. The new shoots are dwarfed. If the infection is heavy, the leaves are of little use to the plant and it is seriously weakened. The life cycle of the fungus corresponds very closely to that of our common perennials. This makes it very hard to control and it is practically impossible to eradicate it from a field of plants. The diseased plants should be removed and destroyed and all of the wild blackberries in the neighborhood should be gotten rid of. The planting of the resistant Snyder is recommended.

Yellows is a disease of red raspberries. Its exact cause is unknown. It usually occurs during the second year after the plants are set. It then occurs annually thereafter and may become very serious, due to the gradual weakening of the plants. The plants become stunted and are of a sickly yellow color. A bushy habit takes possession of the plants. The leaves are small and crinkled with the margins curling downward. The leaves take on a peculiar purplish hue in the early fall. The berries on the diseased plants are small and worthless, their flavor being bitter.

Destroy the diseased plants in the established plantations. Use only healthy plants for starting new fields. Place the plants on well drained soil, since the fact has been repeatedly observed that the red raspberry cannot stand wet feet.

Spur blight and blue stem, two other serious bramble diseases, are not of much consequence in Michigan at present. Their early appearance here is possible and probable, unless we establish a strict quarantine against shipments of plants from other states and remove all diseased plants in Michigan plantations by thorough inspection of the same.

Several general rules may be stated in regard to bramble disease control. Set only healthy plants; set them on well drained soil which

is thought to be free from any of the diseases of brambles; keep the patch as free of trash and rubbish as possible and practice clean cultivation. If disease appears after the plants come into bearing, cut all diseased canes each year and after the fruit has been harvested. Do not forget, however, that raspberry anthracnose can be controlled by spraying. The dormant application of lime sulphur, of one to twenty strength is the most important one in the control of this disease. It often gives such control that further applications are unnecessary.

In spite of these various diseases, and the seeming impossibility of their efficient control, the future of the bramble fruits in Michigan is as bright, or brighter, than it is in most of the neighboring states.

OPPORTUNITIES OF WOMEN IN THE HORTICULTURAL WORLD.

RUBY MIRIAM LEE, LIMA, NEW YORK.

Suffrage has placed women politically, on an equal footing with her brothers and the same opportunities are now offered to them, with the same hardships, responsibilities and risks.

What are some of the opportunities that Horticulture offers women? I have only to relate to the seed concerns engaging trained women and to the women seed analists.

The fields dealing with floriculture, with nursery growing with small fruits and general fruit growing, are now being operated by the women who have the heart and hand to work with good old Mother Nature.

One of the most alluring of these occupations, and one that women by their finely developed senses, should be eminently fitted for, is landscape gardening. It is a field almost untrod by them with opportunities undreamed of, for pleasure and for profit.

The women workers and teachers of nature study classes, of gardening supervision and consultation lead the esthetic nature of their students into the realm of appreciation and realization of their dreams.

Plant pathology and hybridization are parts of the many branches of laboratory work. Have you ever stopped to think whence comes the perfume, what makes the violet blue, what causes the doubleness of certain flowers? Do you know that you might be the one to find out if you cared enuf about it?

To-day many extension specialists are women, and they are taking to the rural parents, and to their boys and girls, the fruits of their studies in Horticulture. This may be thru the farm bureau work, boys and girls clubs or rural organizations.

Another field now taken up by women is the teaching of horticulture in the secondary schools and in some of the colleges. In Michigan, this holds forth much pleasure and profit in giving to humanity.

When we stop to think of all the marvelous and beautiful cultivated plants, we wonder if there can possibly be room for improvement but here is where imagination soars and if your soul is receptive, Nature will whisper in your ear, and out of the Infinite flower forms will float before you, an ideal which will be fixed upon your mind with determination to realize this ideal, for in the floral kingdom ideals may be realized.

Before a woman can succeed she must learn to depend upon herself. In going into any branch of Horticulture, a woman should know her

own capabilities, the needs of her locality, and not try to make people who want cabbages buy roses, even tho the roses do please her esthetic taste and cabbages offend it.

The opportunity for women in Horticulture is as an uncultivated fertile field awaiting a sower. The harvest is certain and will be in accordance with their efforts.

PRECOOLING OF SMALL FRUITS.

J. S. BAILEY, LAKEWOOD, OHIO.

There are two very important factors in preparing small fruits such as strawberries, raspberries, and cherries for shipment. These are (1) precooling and (2) careful handling. I shall discuss very briefly the precooling of small fruits for Michigan.

Up to the present time the Michigan grower of small fruits has been at the complete mercy of the Chicago and Milwaukee markets and local canners for the simple reason that he has been unable to successfully ship his fruit to greater distances. It not infrequently happens that with only a few hundred miles added to his shipping radius he could realize two or three times his actual profits.

Serious as this situation may seem at first, it is by no means as bad as it looks. A solution has been worked out and proved successful, and all that is necessary is the adoption of the solution by the Michigan grower. This solution lies in precooling before packing for shipment.

The small fruit growers of the Pacific coast have been able to ship fruit by the precooling method to points east of the Rocky Mountains, a distance of not infrequently 2,000 miles. If this can be done in the West, there is no good reason why our growers should not be able to ship their fruit to St. Louis, Omaha, St. Paul, Cincinnati, Pittsburgh, and other cities. What we want is a greater shipping radius and precooling put that within our reach.

The precooling plant may be put to another very good use during the peach shipping season. No grower likes to send his peaches to an already glutted market. By placing the peaches in the precooling rooms they can be quickly cooled down and held for one or even two weeks until the market is in better condition.

Let me warn you, however, not to expect too much from precooling unless it is properly done. Careful handling is a very necessary prerequisite to precooling. Two or three bad berries in a crate may cause the whole crate to appear from storage in bad condition.

Precooling must be done promptly in order to check the ripening processes and the growth of molds as soon as possible. It must be done thoroughly also for half a job is no better than no job. Unless the fruit is quickly brought down to a temperature of about 35° Fahrenheit the work is practically wasted.

It has been found that plants used for precooling only have not been successful because they can be operated only a small part of the year which makes the overhead too high. In fact precooling has come into ill repute in some sections of the West for this reason and from the fact that plants of too small capacity have been constructed. To be highly successful a precooling plant should be operated in connection with a

cold storage plant. Special rooms with extra piping are best suited for the purpose of precooling. When properly carried on, precooling has proven to be highly successful and there is no reason why it should not prove to be a big success in Michigan.

I am informed that some of the growers of Berrien County have formed a company to erect and put into operation a precooling and cold storage plant. As pioneers in this project in Michigan let me wish you speedy success in your enterprise.

PLANTING THE RURAL HIGHWAYS.

J. K. COSGROVE, TRAVERSE CITY, MICH.

The farmers and townsmen of the counties of Kent and Wayne may well congratulate themselves. I speak in high praise for these counties because they have been first to put into practice the development and beautification of their county roadsides.

Nothing goes farther to give a city, village, or countryside the air of peace, prosperity, and happiness than an abundance of well kept trees.

We as the inquiring public are asking these two counties how the work of planting trees along their rural highways was accomplished and we are told that its success may be credited to but one predominating condition and that was the cooperation of the state, county and private individuals.

As farmers especially we may appreciate what cooperation has accomplished for us in the past in way of marketing our fruit, storing our grain, and manufacturing our dairy products. The same practice governs whatever success we may attain thru tree planting, along our highways.

It has been a question in the minds of many conscientious farmers and owners of county land as to whether the planting of trees along the highways by individuals or communities would be tolerated by the state highway commission. I may say that the practice is very much encouraged providing the planter of said ornamental trees will abide by the laws of cooperation. In some localities communities have organized tree planting clubs and such trees as the common pear and apple have met with success as roadside trees while in other sections ornamental trees have been selected. It is of little significance as to which kind are planted so long as the plantings are sanctioned by the Highway Commission of the State and County.

The State Highway Commission has laid down the following laws in regard to Highway plantings (Section 3) "The owner of any real estate bordering the highways may plant approved ornamental or fruit bearing trees along said highway and shall receive an annual credit of five cents per tree upon his highway repair tax. Trees must be six feet in height at time of planting and not less than twenty feet apart. All said trees and their products shall belong to the property owner under the provision that he maintain said trees in way of trimming and protection."

In closing I may say that the practice of roadside plantings has been very successful throughout the state of Ohio as well as other states and we are informed that the long rows of stately trees not only raise

the value of the property upon which they border but that they greatly reduce the upkeep of the highways in preventing the erosional or washing out effect so common with out Michigan highways. The washing away of soil from the road bed is said to be checked by the masses of deep tap roots sent out by the tree.

Let us stand for better rural highways in Michigan, better not simply by improved road-beds, but better to the sense of sight, by being most pleasing and satisfying to the eyes because of the plantings of beautiful trees that characterize their boundaries. It is the hope of those persons interested in rural improvement to see every county in this state take up the tree planting slogan so that in half a century from now the highways of the state will be bounded by long rows of beautiful trees.

ORCHARDS IN ALFALFA SOD.

F. M. HAZEL, SOUTH HAVEN, MICH.

Altho alfalfa has been grown for hundreds of years as a field crop, we have no record of it being used as an inter crop or companion crop in orchards. Therefore, we have no definite data in the history of Horticulture which can be quoted for evidence.

Since alfalfa has come into prominence in Michigan and other states as a field crop, and has given such good results, both from the standpoint of a cash crop and as a soil fertilizer, it is not strange that experiments should be started with alfalfa in orchards.

Clean cultivation had been practised in the orchards of the Winachee and Yakima valleys of the West so long that the supply of humus in the soil was depleted or "burned out" to such an extent that the trees were not doing well. Some way had to be found to increase the humus content. It was then that some growers turned their attention to alfalfa, and as far as we are able to judge, their efforts have been a decided success. They remove two crops for hay and leave the other two for a mulch, and it pays better than clover.

In Michigan experiments were started along the same line, but more particularly to find a crop that would answer the following requisites: (1) a crop which would pay well while the trees were growing or before they reached the bearing age, (2) a crop which would increase the supply of plant food in the soil and not interfere too much with the growth of the trees, (3) a crop which could be easily harvested. Alfalfa seems to be the ideal crop.

Ballard Bros. of Niles, Michigan, took a bold step and planted an orchard in alfalfa sod. The young trees were well fertilized the first three years with nitrate of soda and made as good a growth as trees grown under ordinary field conditions. The trees have been standing in this sod for seven years and are fully as large and healthy as trees of of the same age grown under ordinary methods of culture. Three and four crops of hay have been cut each year and harvested. Very little mulching has been done in this orchard, so the hay crop has been almost clear profit. At the same time the trees are coming to an age when they will bear fruit at a profit. The soil in Ballard's orchards is a heavy loam and this partly accounts for their success.

On the lighter soils of the state it would be advisable to vary their method of culture to a certain extent. In the first place the soil must

have proper preparation, liming, etc., to grow alfalfa. Practically all of the failures to grow alfalfa in Michigan have been due to this lack of preparation. Probably the best results will be secured by growing the trees under clean cultivation for a year or two, fertilizing well with nitrate of soda. Seed to alfalfa and when the first crop is ready to cut, use a part of it for a mulch supplemented by commercial fertilizers. Harvest the entire next crops, but use a part of the last crop for a mulch. While the trees are very small very little mulching material will be necessary, but as the trees grow older and larger this amount must be increased.

Some growers say that alfalfa takes too much moisture from the bearing orchard and will not grow it for that reason, but there are no facts to back up those statements. There are no bearing orchards in alfalfa sod in Michigan which have been grown there. If the practise I have suggested is followed, that is, mulching supplemented by commercial fertilizers, there is no reason to believe that the bearing orchard will suffer from lack of moisture. Alfalfa is deep rooted and after it is well established it will not compete with the trees for moisture to any extent.

There is one objection to the system which must not be overlooked. Alfalfa produced a succulent growth late in the fall which furnishes an ideal place for the buffalo tree hopper. This insect feeds on the alfalfa and late in the fall goes to the trees and lays eggs in the branches and twigs, the result being that young trees are sometimes severely injured or killed. After the tree is four or five years old the damage is very slight. This pest will be met with in many orchards where alfalfa is not grown so it is not considered a reason for not adopting the practise. The benefits more than balance any harm that may be done. A large number of orchards are being sowed to alfalfa and we expect that within a very few years it will be common practise among the growers of the state.

ADVERTISING FRUITS.

A. D. SMITH, DETROIT, MICH.

Everyone knows that advertising plays an extremely important part in any business of to-day. It is equally as important in the business of horticulture as it is in any other business. Yet compared with groups in other enterprises, the orchard men have done practically nothing in this line! Take for example the tobacco industry—each year sees new brands of cigars and cigarettes crowded into the market and finding a ready sale. There never seems to be a slump in the tobacco trade, useless merchandise that it is! This is purely a result of successful advertising. On the other hand nearly every year sees a slump and low prices in fruits, useful and healthy merchandise. Why is this so? Largely, if not totally, because of inadequate advertising. Something must be done!

Aside from the usual exhibits at fairs and horticultural shows, I believe that the greatest opportunity for advertising fruits is thru the use of window displays. These window displays are practical to both, the large grower or co-operative association operating in cities, and also the small grower selling thru the country store.

As an example of the former, I have in mind the case of one of the largest apple growers in a certain eastern state. This man went to a large city of the state and arranged to put an exhibit of his fruit in one of the windows of a large downtown store. In the center of his exhibit two barrels were tipped over with the apples pouring out in a graceful pile. On either side of the barrels were boxes and baskets of various sizes filled with the delicious looking fruit. In the background were photographs of orchard scenes together with advertising placards. It was a simple but very effective display, and as a result of it the grower received over five hundred inquiries about the price of his fruit. Of course the renting of the window space was expensive but the results more than repaid him for the cost.

To show you what can be accomplished by the small grower thru advertising I will mention the case of an orchardist near a small western town who had several hundred barrels of Jonathan apples for sale. The general market was dull but it occurred to him that there might be a demand for his apples if he could only get them before the people in an attractive manner. He talked the matter over with the local grocer and secured permission to put an exhibit in his window. He then filled small uniform baskets with his apples and arranged them attractively in the window. The apples looked so inviting that anyone who liked apples could not get by without going inside and buying a basket. The result was that the grower sold his crop at a much better price than he ordinarily would have received—simply because of advertising.

Now, lest you think that this advertising is applicable to apples alone, I will endeavor to prove to you that any fruit can be successfully and profitably advertised.

As you may or may not know, previous to this year no attempt had ever been made to advertise deciduous fruits. Skepties had always said that any attempt at advertising these fruits was useless as the season is too short.

Nevertheless this season a live and enterprising association in the west, The California Pear Growers' Association, threw precedent to the winds and tried it. They chose two eastern cities for their experiment! Philadelphia and Boston. In these two cities they secured the use of four thousand store windows. In their advertising displays they used banners, pictures, placards, and an abundance of delicious looking Bartlett pears.

What were the results? Did it pay? Judge for yourself. Here is the data. Of all of the pear markets in the United States Philadelphia and Boston were the only two to show any gain in sales over the previous year. These two not only showed mere gains but they showed very substantial gains as the figures show that Philadelphia gained 102%, and Boston 130%! This advertising campaign sold 24,000,000 additional pears in one month! These two cities absorbed 204 additional cars over the previous season's record. These figures certainly prove that advertising can be effectively used in the sale of deciduous fruits.

As a result of this successful venture, the plum growers, the cherry growers, and the peach growers of California are awakened to the possibilities of good advertising. This is shown by the fact that the Pear Growers' Association has received many inquiries about their campaign, and I believe the time will soon come when every eastern city will be

thoroughly covered by yearly advertising campaigns of not only California pears, but also California cherries, California plums, and California peaches.

To my mind the first step forward has been taken by the California growers and it is very commendable indeed. What does this mean to the Michigan growers? It means just this, that unless they too take a step forward in advertising, Michigan will lose her rank as one of the most foremost states in commercial horticulture. For this reason I want to impress upon you the necessity for more systematic and effective advertising. We must advertise if we are to safeguard the future of our orchard industry.

WHY IT PAYS TO PURCHASE GOOD NURSERY STOCK.

G. W. R. BALDWIN, BRIDGMAN, MICHIGAN.

As fruit growers each one of you will at sometime be buying nursery stock. Whether you buy fruit trees, small fruit plants or grape vines, or whether you buy for a home garden or for a commercial planting, you will want to be sure that what you do buy are first class plants and that they will give satisfaction.

To secure this class of plants you will have to pay more than for a lower grade of plants. There are several things that go to make up a good nursery plant and they are, briefly,—trueness to name, without which a plant is worthless to the grower; healthiness and vigor, which are necessary for good growth and production; freedom from disease and insects, without which no plant can be healthy and vigorous; and lastly your plants should be carefully handled, packed and shipped so that they will reach you in good growing condition.

None of these desirable features of good stock can be had by haphazard growing methods. The production of good plants requires an expert knowledge of nursery practice and it also means the use of much labor and money to give the constant proper and efficient care which is necessary. Plants will not come true to name if left to propagate themselves, neither will they be vigorous and healthy, or free from disease. You can readily see that in the growing alone, of good plants there is considerably more expense than would be necessary to grow low grade stock.

Further than this there are one or two other important reasons why good nursery stock costs more money. In regard to fruit trees, the best stocks for their propagation are grown chiefly in Europe—mainly in France. Due to the war, the cost of these stocks has more than doubled. Attempst are being made to produce good stocks in quantity in the United States, but up to the present time the results have not been entirely satisfactory, and the number grown is too small for the demand.

Considering small fruits, the best plants of any kind are those produced in fields where plants are grown for plants only. As an example, some fruit growers reset their strawberry beds with plants dug from between fruiting rows of their bearing beds. Such plants are small, end-runner plants—a by-product of low vitality. The nurseryman growing his stock for plants only, throws out these plants dug from between the rows. This method means that the nurseryman can use his land for plant production only. He must spend more labor in its care

and must use more fertilizer than is necessary for fruit production alone. Good plants are produced only by specialized and intensive means, which makes their production more expensive.

These are, briefly, some of the reasons why it pays to purchase good nursery stock and thereby be sure of getting plants that are true to name, vigorous, free from disease, and carefully grown, handled and packed. They will give you satisfaction.

PARADICHLOROBENZINE FOR PEACH TREE BORERS.

G. E. WILSON, ST. JOHNS, MICHIGAN.

For several years experiments with soil fumigants have been under way. Sodium cyanide was among the first that were used, but this is dangerous to the tree and it is also very dangerous to man. In 1919-20, the first use of paradichlorobenzine was made by the U. S. Department of Agriculture and the New Jersey experiment station. The work was first started in Michigan in 1920. This year, 1921, saw its use in six counties.

Paradichlorobenzine is a white, crystaline substance, insoluble in water, and the evaporating gas is heavier than air. It is not dangerous to man, but it causes death to the peach borers.

It will be necessary for clearness to discuss the subject under six points, first of which is that it can be used safely on trees six years old or older, and though no definite recommendations are made for younger trees, it is probable that a way will be found to use it on trees as young as three years.

The second point to be observed in the treatment is the amount of the substance applied. This varies from ¾ to 1 ounce on the older trees and ½ to 1 ounce on the younger trees, with a short exposure of 10 to 14 days. In the work done to date, none of the varieties of peaches seem to be injured by the treatment. The crytals should be finely powdered, passing through a ten mesh screen or finer, for, the finer the crystals, the more surface area, and consequently a greater rate of evaporation. When injury occurs, the growing portion of the tree, or cambium layer, is dotted with fine brown spots which eventually converge, the bark shrivels, and the tree dies.

A third point to be remembered, and one that is very important, is the preparation of the tree prior to the application. All of the refuse around the base of the tree should be removed to the bare ground, being careful not to disturb the top soil thereby creating air pockets in which the gas will collect, making the results unsatisfactory. If there is a large quantity of gum exuding from the tree a few inches above the ground level, it is advisable to build the ground level up to this point, and to remove the gum before making the application. In case this is done, the ground should be well packed.

The fourth point to be kept in mind is that the paradichlorobenzine crystals should be distributed in a continuous circle, one inch wide, and the center of which is two inches from the trunk of the tree. In covering the crystals, the first soil should be sifted on so that the crystals will not be disturbed. The rest of the soil can be shoveled on and mounded up around the tree. This mound should be well packed with the back of the shovel or any other implement for tamping soil.

The next point of importance to be observed is the condition of the soil, namely the soil temperature and the soil moisture. The temperature of the soil should be 55 to 60°F to a depth of 4 inches. This condition exists in Michigan between the last of May and the last of September. If lower temperatures are had, the gas does not evaporate as quickly and the oxygen requirement of the borers is less, consequently a longer exposure to kill them is necessary, and this may be injurious to the tree.

The amount of moisture in the soil at the time of making the application should be very slight, in fact, a dry or semi-dry soil is desired. If the soil is wet, the air spaces between the soil particles are filled with water, consequently the gas cannot penetrate the soil, and the gas is highly insoluble in water. A wet soil tends to be cold and this slows up the evaporation, so that a longer exposure is necessary.

The time of application is another essential point and it should be from August 25th to September 10th. The temperature then ranges from 55 to 60°F and even higher. An application at this time of the year gives ample time for the crystals and gas to get out of the soil before freezing weather. This treatment also prevents further infestation in the fall and keeps the trees from borers during the winter, the following spring, and the early summer months. One application seems to be sufficient, although in very bad cases, it may be advisable to make two treatments with short exposures,—one in June and the other in August. Early spring treatment is not advised, since the soil is too cold and wet.

Paradichlorobenzine may be obtained from the following companies: The Dow Chemical Co., Midland, Michigan; Niagara Sprayer Co., Middleport, N. Y.; and the Hooker Electro-Chemical Co., 25 Pine St., New York City. The price ranges from 15c to 30c per pound, and the cost of making the application, including labor, ranges between 3c and 4c per tree.

In six counties,—Calhoun, Berrien, Kalamazoo, Van Buren, McComb, and Cass,—940 trees were treated and the treatment was highly successful. That should be sufficient evidence for the most skeptical grower, but for those that are still in doubt, it is recommended that they try the treatment on a small block of trees. When you stop to think of the ease with which this treatment is given, in comparison with the digging out of the bores by hand, there should not be a doubt as to which of the two methods is the best, the least injurious to the trees, and the more pleasant.

THE OUTLOOK FOR PEACHES IN MICHIGAN.

G. G. GEISLER, HARTFORD, MICHIGAN.

Peach growing is an important industry in Michigan, especially in the western part and centering around the southwestern section. The peach industry of recent years reached its climax about 1916, the crop of 1917 being almost a total failure. Many of the orchards were killed in the winter of 1917-18. About 50% of the trees were killed outright and the remaining 50% were damaged to such an extent that the producing power was decreased to about 25 or 30% of what it was before the freeze.

In considering the future of the peach industry in Michigan we must remember that many of the best orchard sites have grown two or three orchards and the soil has been depleted of much of its natural fertility. A careful system of soil renewal must be taken into consideration before replanting many locations to peaches. The same is true of many of the peach growing sections adjacent to Michigan.

In 1906 the peach orchards of Michigan were again almost entirely frozen out. This resulted in many new orchards being planted to apples, using peaches as fillers. Today most of these trees are gone, and it will be only a year or so until they are all gone. Since the winter of 1917-18 there has been very few new orchards planted to peaches. Every section east of the Mississippi is situated the same way with the exception of the Georgia and New Jersey sections. These sections cannot be considered as competitors to Michigan because Georgia peaches come onto the market long before Michigan peaches, and New Jersey peaches are all marketed in nearby cities. These two sections are the only ones that will increase in production in the next few years—all the rest will decrease.

You will find that those growers who are planting peach orchards today are those that are more far sighted, and businesslike men. I firmly believe that now is the time to plant peaches, because of the decline in the number of trees and the lack of planting of new orchards. There is also a disinterest in the peach business due to several reasons. The peach orchards that are out now are getting pretty old, and they will soon be gone. When the other fellow gets out it is usually a good time to get in. The man who gets into the peach business now I believe will be the man who will make good at it.

There are several reasons why peaches have not been planted in the last few years.

1. Scarcity of trees and consequent high prices. Trees have been selling from 40c to 60c each. At the present time they are getting back to normal, and it will be easier for a grower to get an orchard started.

2. High price of labor and uncertainty of harvest help. If a grower had a crop it was uncertain whether he could get help to harvest it, and if he did it came very high.

3. Many of the best orchard sites have been planted several times to peaches or are now occupied by apple orchards, so that some of the best orchard sites are not available at the present time.

4. Many of the growers have hesitated about going into the business on account of its uncertainty as shown by the prices of the last few years.

5. At present grapes are being grown in the same sections and the growers attention is being attracted to them because of the comparative certainty of crop and the recent high prices.

For these reasons peach plantings have been very scattering the past few seasons. We can expect to pass thru several generations of peach trees before similar conditions return.

At the present time I think that the conditions are favorable for replanting of peach orchards, paying particular attention to selecting would be unwise to plant indiscriminately on sites that are just fair or even poor. Peach orchards should be planted on good sites or they should not be planted at all.

Then followed the Election of Officers for the ensuing term.

Mr. Friday: I nominate the present President, Mr. George Hawley as President for another term. This motion was duly seconded.

Mr. Daley: I move you that the rules be suspended and the Secretary be instructed to cast the ballot of the entire organization in favor of Mr. Hawley. Motion was carried. Mr. Hawley is elected President by the vote of the Secretary.

Mr. Hawley then took charge of the meeting and spoke as follows: It is no small honor to act in any capacity in a body of this kind. It means a great deal more to the people of Michigan then we can imagine. It is the greatest factor in the different horticultural interests, which are very large. The next in order will be the election of the Secretary for the year.

Mr. Rogers: I nominate our present Secretary, Mr. Farrand. Motion was duly seconded.

Mr. Myan: I move you that the rules be suspended and the Secretary be instructed to cast the vote of the entire organization for Mr. Farrand. The motion was carried. Mr. Farrand is elected Secretary for the ensuing year.

Member: I nominate Mr. J. P. Munson for treasurer. Motion duly supported.

Member: I move you that the rules be suspended and the Secretary be instructed to cast a vote of the entire organization. Motion carried. Mr. Munson is elected as Treasurer for the ensuing year.

Mr. Hawley: There being two members on the board whose terms expire, the election of these members will be taken up. Mr. Rogers and Mr. Friday who are both eligible for reelection.

Member: I nominate Mr. Rogers and Mr. Friday to succeed themselves on the Board. Motion was duly supported.

Member: I move you that the rules be suspended and that the Secretary be instructed to cast the ballots for the entire organization for Mr. Rogers and Mr. Friday as members on the board. Motion seconded. Motion carried.

Mr. Friday and Mr. Rogers were elected for the ensuing three years.

Mr. Hawley then asked if there was any further business to be taken up at this time—there being none it was announced that if anyone has any resolution to come before the Society to please take same up.

Treasurer's and Secretary's reports were postponed until the session on December 8th.

Mr. Satterlee was then called upon to read the report of committee in charge of the Lyon Memorial fund.

ANNUAL REPORT OF JAMES SATTERLEE.

SECRETARY OF THE BOARD OF TRUSTEES OF THE LYON MEMORIAL FUND.

To the members of the Michigan State Horticultural Society:

An informal meeting of the Board of Trustees of the Lyon Memorial Fund was held at East Lansing in June at the time of the annual commencement exercises and alumni meeting at the Michigan Agricultural College. All the members of the board were present. No other meeting of the board has been held until this morning here in Grand Rapids at which all the members of the board were present. President Monroe

examined the list of investment securities presented by Treasurer Garfield. There have been some changes made in the list and the market value has fluctuated but the interest has been paid promptly. A full report of these securities and the income received therefrom is appended herewith in the report of Treasurer Garfield.

The arrangement for the use of the South Haven land, by the State Board of Agriculture, has been continued but the rent received therefrom has nearly all been used in the payment of a special tax levy made by the Village of South Haven for a sewer passing through or near the property.

The following is Treasurer Garfield's report to me which was made on December 2, 1921.

Grand Rapids, Michigan.
Dec. 2nd, 1921.

Mr. James Satterlee,
Secretary Board of Trustees, Lyon Memorial Fund,
Lansing, Mich.

My dear sir:—

The year for closing up the account of our trusteeship has arrived, and I am enclosing the following statement which in your discretion you can use for your annual report as Secretary. The investments have changed somewhat, because some of the securities were maturing, and it seemed to me that now was a good time to make a shift, and I think in every case improvement has been made. The following is a list of the permanent investments:

United States Government Bonds	$ 150.00	
Swiss Federation Bond	1,000.00	
Savannah Electric Co. Bond	500.00	
Commonwealth Power Co. Bond	500.00	
Consumers Power Co. Preferred Stock	1,500.00	
Worden Grocer Co. Preferred Stock	2,000.00	
Dykema Note	335.00	
Brazil 4's	400.00	
Cities Service Debentures	100.00	
Montcalm Co. Bond	1,500.00	
Rio Janerio Bond	1,000.00	
Total		$8,985.00

The funds entrusted to our care are—

Lyon Memorial Fund	$6,600.00	
Life Membership Fund	2,310.00	
Total		$8,910.00

This makes an over investment of seventy-five ($75.00) dollars, but stocks nowadays vary so much in price from week to week that this margin probably had better be maintained.

There has been no report made of additions to the Life Membership Fund, from the Secretary of the State Society, during the year.

For ready reference and to give permanency to this annual record, I will supplement the above report by a transcript from our savings book of the items of income and disbursement during the year:—

Balance on hand November 4th, 1920			$24.57
Dec. 1, 1920, Bank interest			5.97
Dec. 2, 1920, Worden interest			70.00
Jan. 4, 1921, Consumers Power, interest			22.50
Jan. 10, 1921, Savannah interest			12.50
Jan. 31, 1921, Rent South Haven Land			275.00
Feb. 28, 1921, paid Taxes		$229.36	
Mar. 9, 1921, paid Taxes		37.05	
April 4, 1921, Consumers Power interest			22.50
June 2, 1921, Worden intersest			70.00
June 2, 1921, Bank interest			1.99
July 6, 1921, Consumers Power interest			22.50
July 11, 1921, Coupons			3.16
July 11, 1921, Swiss interest			95.00
July 11, 1921, Great Britain interest			13.75
July 11, 1921, Detroit Gas interest			25.00
July 11, 1921, Commonwealth interest			35.00
July 16, 1921, Savannah interest			12.50
Oct. 5, 1921, Consumers Power interest			22.50
Oct. 7, 1921, Great Britain interest			13.75
Oct. 7, 1921, Swiss interest			55.00
Oct. 25, 1921, Bond premium			9.66
Nov. 1, 1921, Detroit Gas interest			25.00
Nov. 2, 1921, Coupons			3.19
Nov. 4, 1921, Cities Service interest			.58
Dec. 1, 1921, Bank interest			5.73
Dec. 2, 1921, Worden interest			70.00
Dec. 2, 1921, Paid State Society		625.00	
Dec. 2, 1921, Balance on hand			$25.96

Trusting this accounting may meet with your approval, and that it can be embodied in your annual statement, I am

Yours faithfully,
Chas. W. Garfield,
Treasurer.

Read as a part of the report of the Secretary of the Board of Trustees of the Lyon Memorial Fund at the Annual Meeting of the State Horticultural Society at Grand Rapids, Mich., Dec. 7, 1921.

James Satterlee,
Secretary of the Board of Trustees of the Lyon Memorial Fund.

(Memorandum) On motion the report was accepted and adopted, and ordered printed as a part of the report of the annual meeting of the State Society for the year 1921. J. S.

Motion was made and supported that this report be accepted and adopted as read. Motion carried.

Mr. Garfield was then called upon to make a few remarks which he did as follows:

"I am always glad to be at this meeting. It is a satisfaction to me to look into the faces of such a large number of young men that have come into this field and are taking hold of its problems and carrying on its work. I am proud of the Society, proud of the progress in the State of Michigan that can be laid almost directly to this Society. Horticulture has more to do than any other science or art in the attractions of our state."

After a few more appropriate remarks by Mr. Garfield, Mr. Nichols of the Michigan State Farm Bureau was called upon to tell about the meeting he attended in Atalanta, Georgia.

REPORT OF ATLANTA MEETING OF FRUIT COMMITTEE OF AMERICAN FARM BUREAU FEDERATION.

JAMES NICHOL, PRESIDENT, MICHIGAN STATE FARM BUREAU.

Ladies and gentlemen: You notice that I am on the program to report the Atlanta meeting of the Fruit Committee of twenty-one. There was nobody admitted but accredited delegates, not because they wanted to keep things secret, but they did not know what they were up against. This was the first meeting where the Fruit Growers of the South met with the Fruit Growers of the Northern Country.

Most every fruit district of the United States was represented, including Florida, Washington, California, all of the Eastern States. One or two of the minor fruit growing states were not represented and Wisconsin, and strange to say Georgia was not represented. Different delegates voiced the opinion that the market situation could not be changed at the present time, but there is nothing that cannot be improved. Some of the men that have been marketing fruit are improving the system we now use. It was very interesting to listen to the different methods employed.

No differences between the different sections of the United States could not be reconciled. The marketing of fruit is a universal problem. That does not mean that we are going to entirely do away with competitive marketing.

One gentleman was representing a large fruit interest and told what they had done in the way of advertising. They had heard some discussion in regard to vitamines. He did not know what it was—but he started advertising that the fruit that he was selling contained vitamines. He soon received many letters asking how they knew that they contained these vitamines and asking for testimonials. Of course they could not then—but today he stated they could give one hundred or more testimonials from people who say they have been benefited by eating their fruit. But when he started they knew nothing about it.

Another fruit distributing agency is to have women abroad in the United States today, and they will go to any society that will listen to them—a ladies club or church society. This lady will address them and explain the value of the fruit. She will talk in a general way and states that she will be glad to take a committee from this society down to the local grocery and show them how to buy fruit efficiently. Then the question—what grocery will she take them to? Of course this is all settled in advance. What effect does this have on the mind of the grocers? Take a committee of three means perhaps a hundred or a

thousand consumers who have heard of the value of the fruit, and where they can get it. This lady explains that it is not necessarily the smoothest, the highest colored fruit that is the best to buy. For instance oranges—Never mind whether there is a speck on the skin or a little rust, perhaps they are the best oranges. Weigh them to see how much juice is in them. Can we afford to have one organization going abroad in the land doing that? If we join them we can have ten or a hundred advertising our product and selling it. When they can get an audience that are interested, they do not know how to buy our goods, but they are going to be taught how to buy them.

People in this section are particularly interested in apples at this time of year. A canner will tell you that an apple that has a decayed or bruised spot in it is not worth bothering with. If this is true for the canner, it is also true for the housewife. She is not getting as good value as when she is buying No. 1 stock. This is part of the work of this organization to explain that to them. As long as you are telling them the truth it is of great value to them. Truth is mighty and must prevail.

Another proposition that was discussed, but has not been put into effect as yet, was to have a man appear before such organizations as the Kiwanis, Rotary Club, etc. and tell them the value of fruit products. Those local clubs are always glad to have a speaker come and talk on any subject. We have the business men that will listen to fifteen minute talks, if we can provide the speaker.

There has been a great decline in the use of patent medicines by the public. There have been great fortunes made in selling patent medicine to the American Public. Since we commenced advertising fruit the way it has been done, the consumption of fruit has been hurting the consumption of patent medicines. When you tell them there is nothing the patent medicines will cure that fruit won't cure better, they will gladly take interest.

Why not get together on a great campaign of that kind?

There are times when fruit sells cheaper than the cost of production. You were told at the opening of this session of the wonderful possibilities of the fruit business. In my capacity as President of the Michigan State Farm Bureau, I have been over a large portion of this state and in my judgment 95% of the farms in Michigan are not earning the cost of production this year. I think outside of the fruit district some especially favored localities the farmer has made fairly good. It is pretty hard to tell them in the next few years how they are going to get the cost of production. But you people are in a business that no one can compete with you inside of ten or fifteen years. Nurserymen will tell you that trees will bear in three to five years, but you know better.

Your business is absolutely safe if your market is safe. Over on the Pacific Coast those men are seriously thinking and have already laid plans to own their own steamship line to market their fruit to distant ports. Of course we are producers of fruit and when it comes to marketing fruit men who understand that part of it should be the ones to do it.

Every once in a while, every five or six years, we have a bumper apple crop. You know what that means. What do we do with our surplus? We can find a market for our surplus. For two thousand barrels more can be profitably marketed in the United States—find a market for them. As an individual we cannot do that—collectively we can. Some of the

eastern states have been talking about opening oriental or European markets to take care of our surplus. It is risky, but not half as risky as losing the entire crop. They suggested taking some of the surplus over to China and making them eat them. If we have to give away our produce in this country, we might as well give it away somewhere else and the next year they will come after it. We cannot do this individually, or as a state, but we can collectively. This was discussed very thoroughly.

Of course standardization was a thing agreed upon. We cannot get anywhere in marketing fruit without standardization.

"I am my Brother's Keeper!" You certainly are your brother's keeper. If you do not keep your brother, you won't be able to keep yourself. If you know a grower who does not know how to pack his fruit you should help him. What is the use of raising good fruit and putting it on the market when a person does not pack it carefully? Very often it is not because he wants to do it but because he does not know anything different. You must put that fruit grower on the right track. You must handle him through organization—local, state or National. You must market his fruit as well as your own. You must not let his fruit give your fruit a bad name. They take care of this in Idaho and some other states in that section. A man said once that they wouldn't let him ship his No. 2 apples out of the State of Idaho and he wanted the American Farm Bureau to rectify that. Of course, we could do nothing. They would not let them out of the state because they did not want anybody to know that Idaho ever raised a poor apple. Today the Middle Western apple will bring a higher price than any Western apple growing. One man made a remark that he could not see any Michigan Apples—of course not, they are sold and gone into consumption.

We left the meeting with a feeling that the fruit interests of the United States were going to get together, not to scrap, but to adjust the sale of fruit. Make people see the fruit situation as we see it. Work together with the organization.

There are from 600 to 650 elevators, everyone of which is a sales agent for fruit in the Middle West, if you want to use them. They can take any fruits in season and sell them with a minimum expense. That field is open to the East and whenever they want to use it. California and Florida have their own method.

There was a proposition offered in regard to a method of handling a certain per cent of our products through the canneries. The canning interests in California will be very extensive. There will be equally large cooperative canning factories. There will be no room for a small canning factory in California. The situation there is very different than in the Middle West. They can see reason why the fruit growers should not own their own canning factories. I can see a good many reasons why we should not own them. We are not all canners. I think when a man is a fruit grower, he has business enough. The marketing of fruit should be left to people who thoroughly understand that business. Perhaps on a salary basis. Now the proposition was advanced that a certain time of year the fruit growers and canners should get together and decide on the amount of fruit that was going to be canned that year and after the amount was agreed upon the fruit growing people agreed to supply it and the canners agreed to accept. That does not

mean that if the market goes up the canners are not going to get the fruit. We know the faults of the canner and we know the faults of the fruit growers, and it is about 50-50. We are business men and when we make a contract we must live up to it. And a man who does not live up to it is going to eliminate himself before long.

In case anything should happen so they could not can the fruit it would have to be returned and sold by organizations through the ordinary channels of trade. The interests of the canner and fruit growers are identical and that is the buyer and seller. If fruit growing is not profitable you quit it and then what happens? If canning is not profitable then you don't have that channel to get rid of your fruit. The price this fruit is going to be taken at can be arranged at the time the trade is made or it can be arranged on a 50-50 basis that you will take the selling price, less the cost and a fair overhead. That broadens your field in a good many ways. You must realize that canning is not done like it used to be and never will be again. The housewife can buy fruit already canned cheaper than she can can it herself and it is as good and sometimes better. You have not got as large a market in proportion as you used to have in the large cities but the market for canning goes on unlimited.

A campaign for advertising should be maintained for canned goods and pushed to the limit. In figuring in the cost of selling that fruit it will be legitimate to figure in the cost of advertising, in case you should dissolve partnership on this proposition with the canner. If we advertise and push the sale of canned goods the way a patent medicine concern would push, we haven't enough canners to put out fruit to meet the demand.

All restaurants offer you canned fruit and it is very attractive.

Why shouldn't we as fruit growing people follow our fruit from the time we raise it until the ultimate consumer pays for it. We want that consumer to be satisfied because when he is satisfied he is a buyer of our products every year.

This committee of twenty-one is going to try and solve some of these problems. The problem is so big that we do not know when it is going to be solved.

I have tried to tell you in a very rambling way of what we talked of and what we saw the future might bring to us.

We want you people in Michigan especially to consider the following: That is the trucking proposition. It may be a great benefit to you and it may be a great danger. Where a man is hauling his own fruit in truck and expects to do so year after year he is careful to give good goods and only good goods to the customers he expects to sell to today, tomorrow and next year. But the average truck buys fruit in an old orchard. That man is giving the fruit of your neighborhood a black eye. When the person who buys the fruit finds that he has a package that looked good but was not good he does not want any more Michigan fruit. We cannot control these truckmen unless we control them through organizations. If he buys a lot of stuff that is poor and takes it to Kalamazoo and sells it they ask him where he got it. If he says South Haven—next time they see South Haven fruit they are prejudiced against that fruit.

Whether you want to cooperate or not, you must cooperate. You must work with those fellows in New York and Virginia and the West. If you do not you are helpless as individuals in marketing your fruit.

We talked about opening up a market in order to take care of the surplus. New York has a large surplus of apples—they say there is the Middle West—we will take a million barrels and sell them in the Middle West for what they will bring. The same thing happens on the Pacific Coast,—they say all right Chicago is the dumping ground of the world take a thousand cars to Chicago and sell them for what they will bring.

The only man that that will not affect is the man who is raising Northern Spies, because they are raised in Michigan better than anywhere else.

California has an advantage that we have not always had. The orchards are owned by men who have been in business. They were started as playthings. With their money and influence they are getting successful marketing organizations such as we do not dream of in this country. We cannot afford to let New York and Virginia or the Northeast take our market away from us. My friend, Mr. Garfield, made the statement that the financial end of the business was not all that was in horticulture. That is all very true but I know that 75% of the men in front of me could not be here today if they had not sold their fruit at a fairly profitable price.

You're going to get a little cheaper labor, you are going to get a little cheaper packing, you are going to get a little reduction in freight rates, but you are going to get some reduction on the price you get from others.

We want to have something to say about the profit that is taken on our fruit after it leaves our warehouse. It must not be sold at a price that curtails the consumption. If we advertise to the people that we have the most healthful food on the market and then put the price out of their reach it will be very small benefit. It is our business to see that these prices are not charged. The price must be in the reach of the consumer or we cannot expect to market our fruit successfully.

If a man makes a contract, whether he is a farmer or a canner, he must live up to it. We must run our business on a fair and proper business manner and when we sell a man a line of goods deliver them when and where he wants them in the proper and satisfactory condition.

When this stage is reached, we will then be in the most profitable line of farming in the United States.

Mr. Hawley then expressed the opinion that there were probably many questions that we would like to have taken up at this time, but on account of the lack of time, we will have to turn to the next subject.

The winners of the contests were then announced as follows!

Speaking Contest—First place—Miss Ruby Lee, Lima, New York; Second place—F. M. Hazel, South Haven, Mich.; Third place—A. D. Smith, Detroit, Mich.; Fourth place—K. J. Cosgrove, Traverse City, Mich.

Judging Contest—First place—J. D. Wilson, Lansing, Mich., F. M. Hazel, South Haven, Mich., tied; Third place—G. W. R. Baldwin, Bridgman, Mich.; Fourth place—G. G. Geisler, Hartford, Mich.

Secretary Farrand was called upon to discuss work with fertilizers on different kinds of fruits. He stated that after the results of one

season's work and with but few instances where records were obtained from observation the results were so marked that it showed the great possibilities for increasing the yield and size of the fruits both in orchards in grass mulched and those under cultivation and practically all kinds of fruits.

Up to the present time I feel safe in recommending the use of nitrates on a large per cent of the orchards in Michigan, especially those mulched and in sod and especially in the cultivated orchard on the cover crop to increase the growth as well as to feed the trees.

I would hesitate to make general recommendations on the use of Phosphorus and Potash until we have more data and the use of those fertilizers have shown more marked results than up to the present time. The results from the use of nitrates does not always show the first year but usually does the second season. Observations show marked results on all types of soils from the light sand to heavy clay loam.

The hundreds of demonstrations and the results from definite experimenst would indicate that nitrates and possibly phosphate and potash will come into general use on all kinds of fruit as the most economic method of feeding the trees.

DECEMBER 7, 1921.

AFTERNOON SESSION.

ORCHARD MANAGEMENT AT MOUNTAIN GROVE FRUIT FARM.

PERRY C. GRIGGS, ROMEO, MICH.

Mount View Orchards consist of 185 acres of apple trees with peach tree fillers, the apple trees being 36 ft. apart, leaving the peach trees 18 ft. apart.

The essential item in choice of an orchard site, is land adapted to fruit growing. I believe we have an ideal location in that we have perfect air and water drainage, the highest point in our orchard being only a few rods from the center, the ground sloping in every direction from that point.

Our soil for the most part, is heavy clay loam, while the trees may not grow as rapidly as in lighter soil, they are more hardy and last longer. We intercropped and practiced clean cultivation the first two years. After that, we used tractors and disc harrows and still cultivate clean with the exception of a space about 5 ft. square around each tree. This cultivation is started early in the spring as possible and continued until about the middle of July, depending on weather conditions as any time after July 1st, when moisture condition is ideal we broadcast the entire orchard to buckwheat, but allowed to stay on all winter as a cover crop and disced in the ground the following spring.

Our orchards have been fertilized with ammonium sulphate for the past two years. We apply it to the surface of the ground early in the spring at the rate of 12 ounces per tree, which amount will be increased as the trees grow older, the trees now being five and six years old. We used a team and six men, in fertilizing the orchards, each man having a 12 quart pail and tin cup holding amount applied to each tree. The

driver opened the bags and kept the pails filled. We fertilized our entire orchard in one and one-half days in this manner.

Our pruning system is decidedly at variance with the method used in the orchards of the fruit belt. When we set our trees, they were headed very low and have never been touched since they were two years old. In fact they were headed so low that most of the peaches are picked without the use of step-ladders. We will not deviate from this practice as long as the trees show a good growth and produce fruit spurs. Our apple trees receive but very little pruning as we do not believe that heavy pruning is conducive to early bearing. We picked a fair crop of apples last year and from all appearances they will be on good production before the peach trees are gone.

For our spraying, we use the standard sprays for apples, dormant spray, followed by various arsenic sprays. Our peaches receive only the dormant spray for curl leaf with the exception of two varieties, the J. H. Hale and Admiral Dewey, which are sprayed just as the blossoms drop with a solution of two lbs. dry Arsenic Lead and one gal. Lime Sulphur to 50 gal. water. The Admiral Dewey peach receives a sulphur dust application just before picking. This is used to prevent rot.

Being near Detroit, we have varieties of apples ripening in succession during the entire season. The apples begin with the Yellow Transparent, followed by the Wealthy, Snow, Jonathan, Wagner, Rhode Island Greening, Northern Spy and Steels Red, also a few Pound Sweets and Delicious. Of peaches, we have Admiral Dewey, Yellow St. John, Fitzgerald, New Prolific, Elberta, Reeves Favorite, Engels Mammoth, J. H. Hale, Kilken's Smock and Banner with only one white variety of the Champion.

Our fruit is advertised as the Mt. View Brand. We run ads in at least 25 papers in the surrounding towns. We have a small folder advertising our fruit and containing a good roads map on the inside showing the trunk line roads leading to our orchards from Detroit, Mt. Clemens, Ann Arbor, Port Huron, Pontiac, and Flint. We aim to give high quality and good measure thus creating a demand for our fruit.

In regard to harvesting our crop, we are well located as there is no difficulty in obtaining pickers, being within one-half mile of Romeo, with a population of about 2,500. We employ women as well as men, finding that some of our best pickers are women. Our fruit is allowed to thoroughly ripen on the trees, as it is sold directly to the consumer as soon as it is picked for the most part. We picked 2,000 bushels a day during the height of the season this year, sending the surplus fruit to Detroit by motor trucks. In allowing the fruit to ripen on the tree, we get some wind-falls but there is always a demand for them at a fair price. However, we figure in so doing, we get more bushels and a better price than in picking them when green. There are hundreds of machines here daily buying from a bushel to a truck load, many of them being repeat orders from the year before. We also received many calls from outside of the state for our fancy varieties. These latter demands come from parties who had visited the State Fair at Detroit where we had an exhibit which won several prizes. We make ample provision for packages, buying them in car-load lots and prefer carrying some baskets over, than risking any shortage during the harvesting season.

In conclusion, wish to say that through our satisfied customers, we aim to create a demand for Mountain View Brand Fruit, which will absorb our entire production in the future.

A REPORT OF DUSTING AND SPRAYING EXPERIMENTS AND GENERAL DISCUSSION OF SPRAYING PROBLEMS.

BY W. C. DUTTON.

The dusting and spraying experiments carried on by the Horticultural Department in 1921 have been along the lines here indicated:

(1) Control of brown rot on peaches and plums with particular attention to the holding and shipping quality of the fruit.

(2) Testing and comparing dusts and spraying materials for the control of leaf spot on cherries and plums.

(3) Further testing of dusts for the general treatment of apples, pears and peaches.

(4) The control of pear psylla.

(5) Spraying and dusting grapes for rot and leaf hopper control.

(6) Anthracnose control on black raspberries with special attention to reducing the number of applications now recommended.

(7) Developing and testing new and cheaper forms of dusting materials and the testing of "spreaders" in spraying materials.

(8) Determining if a pre-pink application for the control of scab on apples is necessary or desirable.

(9) Control of peach tree borer with paradichlorobenzine.

(10) Testing dusting materials on potatoes for the control of blight, bugs and hoppers.

(11) Testing dry lime-sulphurs and similar materials for scab and scale control and for the control of peach leaf curl.

(12) Bud selection work with apples and grapes.

I shall not attempt to discuss all the lines of work just mentioned but will take up those in which you will probably be most interested.

PEAR PSYLLA CONTROL.

Pear psylla has caused serious trouble during the last two seasons and is one of the most difficult of insects to control. The grower has the choice of two methods of control. The first method has been the one generally used here in Michigan and is familiar to most pear growers. It consists of a dormant application either in the fall or spring to kill the hibernating adults. This should be made on clear, bright days in the late fall or early winter after the leaves have dropped and there has been a sharp freeze which will make the insects less active, or it may be done in early spring before the insects become too active. The temperature should be 45° or more so that the insects will be out of their hibernating quarters, but should not be done on days that are too warm as the psylla will be so active that many of them will get away. If this application is made in the fall, use nicotine sulphate (40%) at the rate of ¾ pint to 100 gallons water and add about four pounds of soap to this. If the work is done in the spring, use the nicotine sulphate as above or a good miscible oil. The bark on the trunks and main limbs should be thoroughly scraped so as to afford as little protection as possible. This should be done in the fall before the spraying is done.

The dormant application should be followed after the blossoms fall by another application of nicotine sulphate in order to get any that escaped the first application. The nymphs of the first summer brood will be on the trees at this time.

Another schedule treatment has been used in some districts and was recommended in this state last spring by the Entomological and Horticultural Departments. This schedule consists of an application of strong lime-sulphur when the blossom buds are ready to separate in the cluster and is directed at the eggs which are mostly laid at this time. In order to determine just what strength of material was necessary and safe to use, I secured from Fennville during the winter a large number of hibernating psylla and took them to Professor Pettit who put them in cages with pear twigs in the insectary. He made conditions as much like spring as possible and the psylla laid great numbers of eggs on the pear twigs. These twigs were separated into several groups and each group was dipped in a different material. Some of the materials used were lime-sulphur at different strengths, lime-sulphur and lime, lime-sulphur and starch, lime-sulphur and Black Leaf 40, Scalacide, and dry lime-sulphur.

Lime-sulphur at the rate of 6¼ gallons in 50 or at a slightly weaker strength with hydrated lime added, gave the best results. Dry lime-sulphur, Scalecide and lime-sulphur with Black Leaf 40 were not so successful. I may say now that Professor Pettit and I expect to continue this work this winter and get all the information possible.

The exact time to make this application might vary under different conditions; but considering the entire spraying schedule for pears, it seems that the best time is when the blossom buds are in what we may call the "pre-pink" stage. This is specially true where pear scab is serious as I have been recommending a prepink application for scab control and the strong lime-sulphur put on at this time is an excellent scab preventive. It is also an excellent time to spray for scale insects and pear leaf blister mite should be reduced by it also. This application would, if made a little later when the buds have separated in the cluster be effective against more eggs as they are not all laid at the earlier stage and in fact they may not all be laid before full bloom and it is because of this that the application after the blossoms fall is necessary.

Some growers have asked if the strong lime-sulphur at this time will injure the buds. It will burn the small first leaves which come out around the blossom cluster but the loss of these has never been serious and the trees will not show any permanent injury. With normal weather conditions it is not probable that it would injure the buds even in full pink but with frequent frosts as we had last spring, there seemed to be a combination of spray and frost injury. This was particularly true with Kieffer. They open earlier and seem to be more tender than other varieties and if the application were timed for an average of all varieties the Kieffer would be too far out. The best practice then, is to spray each variety according to its bud development.

There should then be another application after the blossoms fall with nicotine sulphate and soap or it may be used in combination with lime-sulphur and lead arsenate without the soap. When used in combination with lime-sulphur and lead arsenate the addition of ten pounds of hydrated lime to each one hundred gallons has been helpful in some instances.

The one thing which must be kept in mind, regardless of the method used, is that all spraying for pear psylla must be very thoroughly done. No ordinarily good job of spraying will get results as every adult, egg or nymph must be well covered to be killed. I have watched this closely this spring and the men who really sprayed got results. Growers who did not get results have told me that they were sure the fault was the application and not the method.

No definite rule can be laid down as to how the spraying shall be done, but on trees of much height I think there should be one man on top of the sprayer and one on the ground.

GRAPE DUSTING.

The grape dusting work has again failed to give any definite results concerning rot control as there was so little rot developed on the checks that no definite conclusions could be drawn from the work. Particular attention was given to leaf hopper control and applications were made as recommended by Professor Pettit but satisfactory results were not secured from every application because of a batch of poor material. However, with a satisfactory nicotine sulphate dust which is now available, I am confident that better results will be gotten. This dust is made up of nicotine sulphate and hydrated lime, the lime, of course being used as the carrier. The material was tested in a small way late in the season and was very effective against the leaf hopper nymphs. Its successful use will probably depend upon a satisfactory duster and I hope to have for next season a duster which will give much better distribution of the material than anything that has been available in the past.

RASPBERRY SPRAYING.

The schedule now recommended for anthracnose control on raspberries calls for three applications: one when the plants are dormant, second when new shoots are six to eight inches high, and again just before blossoming. This number of applications gives satisfactory control but of course it would be very desirable to reduce the number of applications if it can be safely done. I have felt that if a planting has once been cleaned up, it may be possible to get good commercial control with less than three applications so carried through an experiment this season to determine the point in question.

The field was divided into four plots. One was left unsprayed as a check, one was sprayed once when dormant, another sprayed when dormant and when growth was about 8 inches high, and the fourth was sprayed the regular schedule of three applications. This work was done near South Haven by Mr. Johnston. It is not safe to make recommendations from one season's work but the results are very promising and indicate that the number of applications may be reduced. The unsprayed plot was badly diseased. The one sprayed three times was practically free from anthracnose. The plot sprayed at the first and second application showed some anthracnose but nothing at all serious and the part which received the dormant only was decidedly better than where no spraying was done. I do not care to make any recommendations regarding this now but simply give these results as a report of progress.

LEAF SPOT CONTROL ON CHERRIES AND PLUMS.

A dusting experiment on plums was carried through the season at Hart on the farm of our president, Mr. George Hawley. Work was done in three separate orchards which included five varieties, namely, Monarch, Grand Duke, Arch Duke, Bradshaw and Lombard. Three applications of dust were made and Mr. Hawley sprayed the other parts of each orchard with lime-sulphur. A check plot was left for each variety. The season however, was so dry until late in the summer that only a very little leaf spot developed even on the checks. The only exception to this was with the Monarch and Arch Duke. The foliage of Monarch seems to react very quickly to any unfavorable condition. About August 1st the foliage of the check trees of this variety were quite yellow but the trouble apparently was not due to leaf spot. On adjacent dusted and sprayed trees, the foliage was in excellent condition. The contrast was shown more distinctly on the last check tree which received some dust. One-half the tree was yellow and the other half green. Later, leaf spot developed on the check but all the trees lost their foliage sooner than other varieties, probably because of their being so susceptible to any unfavorable condition such as dry weather. The Arch Duke check trees showed some leaf spot by September 1st but it could not be called serious. The dusted and sprayed trees were in equally good condition. This work, also, will have to be continued before any definite statement can be made.

Experiments for the control of leaf-spot on cherries were continued this year at Traverse City on the Titus Brothers farm and the work was done by Mr. Johnston. Two varieties, English Morello and Montmorency, were included in the work and the blocks of each were divided into five plots as follows:

1. Check
2. Lime-sulphur, 1½ in 50
3. Bordeaux 4–7–50
4. Copper sulphate dust (20% dehydrated copper sulphate)
5. Sulphur dust (80–10–10)

Arsenate of lead was used whenever desirable. Five applications were made on the Morellos as here indicated:

1. Just before blossoms opened
2. Just before blossoms had dropped
3. Two weeks after the second
4. July 7
5. August 16, about two weeks after harvest.

The Montmorencies were not given the first and last applications. All dusting was done when weather conditions were ideal. The season as a whole was unfavorable to leaf spot development and on the Montmorency trees there was never enough leaf spot to give any conclusive results. Only very little developed on the Morello checks until early in August but from then until September 1st it came on rapidly so that the check trees were defoliated before the middle of September. There was no leaf spot on any of the treated trees but the foliage on both dusted plots was in better condition than where sprayed and the foliage in the Bordeaux plot was better than where sprayed with lime sulphur. The Bordeaux, however, had a very undesirable effect upon the fruit. The cherries were stunted and smaller than on other trees. This, of course,

reduced the yield and lowered the quality of the fruit. I have recently found one report of similar trouble on sweet cherries where it was found that strongly alkaline sprays reduced the size of the fruit by causing in some way a serious loss of water from the fruit, with the resulting decrease in size. This trouble seems worthy of further study as it may be of considerable importance under some conditions.

It may be well to compare this years results with those gotten last year in the same orchard. In 1920 the weather was more favorable to leaf spot development and much of it developed by July 1st. Bordeaux gave best control, lime-sulphur second, and the dusts ranked somewhat lower but the Bordeaux trees lost much foliage in midsummer as the result of Bordeaux injury. The results, then, for the two seasons show that the liquid sprays gave best control of leaf spot the first year but with considerable Bordeaux injury to the foliage and the second year all materials gave equally good control of leaf spot; but the physical condition of the dusted foliage was better and there was the added trouble of stunted fruit on the Bordeaux trees. One factor which may have had some influence on the better results with dust this year was that all dusting was done under very favorable conditions and further, it must be stated that weather conditions were much less severe than in 1920.

PRE-PINK SPRAYING OF APPLES.

The control of apple scab has not been as successful in many instances as was desired. It was not known whether the trouble was that the spraying schedule was wrong or whether it was simply faulty application. Those of you who are familiar with the life history of apple scab know that it is carried through the winter on the leaves on the ground. It goes through certain changes and after it has reached a certain stage further development is dependent upon proper conditions of temperature and moisture. When the right conditions prevail, the scab spores are discharged and carried to the trees. It has always been thought in Michigan that the regular pink or cluster application is early enough to prevent the first or primary scab infection but the results in several of my spraying experiments have indicated very strongly to me that if weather conditions are right, this infection occurs earlier than the pink stage of our earliest blooming varieties. I discussed this matter with Dr. Coons who became interested in the problem and with the result that Mr. Bennett of the Botanical Department made studies to determine just how early the first infection might occur. Leaves were collected daily from the Duchess orchard of Mr. J. C. Maynard, near the Graham Experiment Station, by Mr. Hootman and were sent to the college for examination by Mr. Bennett. I do not care to discuss in detail the results of these studies but will say that they showed the scab spores were mature and ready to discharge this year long before the Duchess blossoms were in the pink or cluster stage. This work will be continued next year.

In this same orchard I arranged a spraying experiment so as to get accurate information in this way. The orchard was divided into three plots and treated as follows:

1. Check plot. No treatment.
2. Regular schedule beginning with the pink or cluster application.
3. Special schedule with a pre-pink application.

Lime sulphur at the rate of 1¼ gallons in 50 was used for all spraying.

It was impossible to get as complete counts as desirable at harvest because of the crop having been practically ruined by a late frost. There were only a few bushels of apples in the whole orchard but they were carefully sorted and counted with the results given in the following table.

Pre-pink Spraying—Duchess Apples—1921.

Treatment	Application	Scabby
Check	0	100%
Regular	3	47%
Prepink	4	16%

The figures show a difference of 31% of scabby fruit between the plot receiving the prepink application and the one not receiving it. All the scab on fruit from trees receiving the prepink application was in a very inconspicuous form and was not easily recognized as scab, while on the trees receiving only three applications the scab was in much larger spots and easily seen.

I did not have any other definite experiments along this line but made many observations whenever possible and found that in practically every orchard of varieties such as Duchess, Wealthy, Transparent, McIntosh, Snow, etc. there was a bad early infection of scab which I am very sure would have been prevented by a prepink application made when the end of each bud could be seen in the compact cluster but before they had begun to separate.

CHEAPER DUSTING MIXTURES AND SPREADERS IN SPRAYING MATERIALS.

There has been a demand by growers who have dusted extensively for dusting materials which do not cost so much as those generally used. This may be accomplished in several ways.

1st. By developing new mixtures which are made up of cheaper ingredients.

2nd. By reducing the proportion of the most expensive ingredient which is the poison.

3rd. By adding some material, such as hydrated lime, which will improve the spreading quality of the dust and consequently make an equal quantity cover more trees.

The final test for any such mixture is this: "Is it efficient?" With these ideas in mind work was begun this year to develop and test certain mixtures which it was thought might do the work.

Another angle of the spraying problem which has been given considerable attention recently by insecticide manufacturers and by some investigators, is the use of "spreaders" in spraying materials. Some call these materials "extenders," "stickers," "defloculating agents," etc. Several manufacturers are incorporating some such agent in their arsenates of lead which is supposed to make the arsenate of lead mix more easily, stay in suspension longer, spread upon the fruit and foliage in a thin

even coating and to make it stick there longer. My experience wit a few brands of lead arsenate containing a spreader shows that the mix very easily and probably when used alone with only water will show the qualities just mentioned but when they are mixed with lime-sulphu they are little if any better than an ordinary lead arsenate. I have con ducted extensive orchard trials of several spreaders used in combination with lime-sulphur and lead arsenate. This work, as well as the experiments with the cheaper forms of dusts just mentioned was done at Belding in the B. F. Hall orchard. These spreaders were used in quantities large enough to give the desired properties to the entire mixture.

The crop in this orchard was badly cut by a late frost so that the results are not worth so much as if there had been a full crop, but the figures are worth consideration.

SPREADERS ON APPLES—1921

Material	Application	Scab				Codling Moth			
		McIntosh		Baldwin		McIntosh		Baldwin	
		Early	Late	Early	Late	Wormy	Sting	Wormy	Sting
Glue—6 oz. L-S.—1 gal. Ld. Ars.—½ lb.	4	—	—	18	3	—	—	10	15
Gelatine—1½ oz. L-S.—1 gal. Lead—½ lb.	4	31	14	17	9	5	4	5	10
Casein, 1 oz. in 50. L-S.—1 gal. Lead—½ lb.	4	26	9	10	1.5	9	11	8	11
Saponin—½ oz. L-S.—1 gal. Lead—½ lb.	4	23	5	12	0.3	4	6	10	12
No Spreader L-S.—1¼ in 50 Lead—1 in 50	4	18	6	4	0.7	7	8	8	20
Check	0	29	85	16	42	37	0	47	1

DUSTING BALDWINS—1921

Material	Scab		Codling Moth	
	Early	Late	Wormy	Stings
90—Sulphur 10—Lead Arsenate	11%	3	15%	14%
95—Sulphur 5—Lead Arsenate	7	3	16	13
Dry Lime-Sulphur Mixture	2.5	4	16	10
75-15-10	2.2	2.7	17	13
Sprayed	10	1.5	9	14
Check	16	42	47	1

I do not consider that these figures show an accurate comparison of the various materials of scab control because of the uneven crop. In several plots much of the fruit was set from late blossoms. The point to which I wish to call particular attention is the uniform amount of early scab on all plots, except those with very light crops. The McIntosh trees all had two pre-pink applications of dust but it did not seem to hold the early infections.

All spraying combinations controlled coddling moth pretty uniformly but there were more wormy apples on the dusted trees than on the sprayed.

I am giving these figures for what they are worth and not as conclusive evidence one way or the other as much more work will have to be done in order to know just where we stand in regard to cheaper dust or the use of spreaders in spraying materials. In regard to spreaders I may add that there seem to be pretty good arguments both ways and I am studying the problem without any prejudices either way. There are several points which must be considered, some of which are:

(1) Cost
(2) Ease of preparation
(3) Compatibility
(4) Efficiency

GENERAL COMPARATIVE TESTS OF DUSTS ON APPLES AND PEARS.

Comparative tests of dusts and sprays on apples and pears were not made on a very large scale this year but there were two or three of interest. One was at Traverse City on the Stickney farm. The orchard is a young one and is made up of several varieties. There was no spraying done, the orchard being dusted except for the check trees. Seven applica-

tions were made but weather conditions were not always favorable. I shall not give detailed results of this experiment but only a general statement. The results were not uniform on all varieties but averaged good. The unfavorable atmospheric conditions probably had something to do with the results and the prevalence of such conditions in any given location should be a deciding factor when considering dusting.

At Fennville on the Broe farm a comparison was made on pears between sulphur dust and Bordeaux. Both plots were sprayed in the prepink stage with strong lime-sulphur for scab and psylla and there were no check trees left because of the prevalence of pear psylla. There were several varieties in the orchard but only Bartlett was used for making counts at harvest and the control of scab was uniformly good on both plots there being only about 2% scab on either. It must be remembered in considering these results that the dust plot had the pre-pink application of strong lime-sulphur which I consider to be a critical application for scab control. The foliage in the dusted plot was in excellent condition and the dusted fruit had what we may call a better "finish" than the sprayed fruit which showed considerable russetting.

Another test was made on the Broe farm with Wealthy apples. The orchard was divided into three plots as follows:

1. Check.
2. Sulphur dust—six applications.
3. Sprayed—4 applications lime-sulphur and 1 of bordeaux.

A pre-pink application was planned but could not be put on because of a shortage at that time of dusting material. The results are given in the following table:

III—SCAB AND CODLING MOTH CONTROL—WEALTHY APPLES—1921

Treatment	Applications	Scab		Wormy
		Early	Late	
Check	0	20%	79%	34%
Sprayed	5	17%	8%	5%
Dusted	6	19%	9%	13%

The figures show that the control of scab on both plots was about the same but spraying gave considerably better results than dusting in codling moth control. I want again to call particular attention to the amount of early scab which is about uniform in all plots.

A similar experiment was made in the same orchard with Jonathans but the check plot showed so little injury that the results will not be given.

PARADICHLOROBENZENE FOR PEACH BORER CONTROL.

There has been considerable work done in the state during the last two seasons with paradichlorobenzene for peach borer control. The Horticultural Department has had several extensive trials and Professor

Pettit has also done work along this line. I will give here the results gotten this fall in the Wadsworth Bros. orchard at Fennville. Paradichlorobenzene was applied on September 2 to about 250 trees and part of them were examined during the first week of October. The lots of trees were selected in different parts of the orchard so as to get a good average as to soil, age and condition of trees, etc.

PEACH BORER CONTROL—1921

		No. trees examined	Borers Alive	Average per tree
Lot 1	Check	18	66	3.7
	Treated	18	3	0.1
Lot 2	Check	14	63	4.5
	Treated	11	0	0
Lot 3	Check	17	48	2.8
	Treated	14	0	0
Lot 4	Check	19	17	0.9
	Treated	17	0	0

No counts were made of the borers above ground but the trees of Lot 4 are older than the others and have many dead places in the bark on the trunks and it was here and around the crotches that most of the borers were found. This condition was shown very clearly in the Chesebro orchard at South Haven where Mr. Johnston did some work this season. In this orchard nearly all the borers were so high on the tree that they were not subject to the paradichlorobenzene.

Another point of interest was brought out in a demonstration made at Manistee by Mr. Farrand. A treatment was made on several trees from which heavy exudations of gum were not removed. When the trees were examined later several live borers were found under the gum as the gas would not penetrate through it to the borers.

We cannot make very definite recommendations for the use of paradichlorobenzene now as it is still in the experimental stage, but the results which we have gotten here in Michigan and others have gotten in other states show that it is very valuable to the peach grower when properly used. It must be remembered, however, that its use must be limited to trees not younger than six years old and that it will not be a cure-all for it will not kill borers which are above ground very far and on some trees most of them are above ground.

The best recommendation we can make at this time is to use it on trees six years old or older and at the rate of ¾ to one ounce per tree. The most effective results can be gotten by applying from September

1st to 10th. The greater part of the eggs will have been laid and hatched by this time. The application at this time will keep the trees free from borers until the next July when the new brood begins. If a fall application is not made, it will probably be advisable to make one about June 1st, but allow it to remain about the trees for not more than two weeks. Open up the soil by pulling the mound away with a hoe or other convenient tool. When treated early in summer, another treatment will have to be made in the fall. The soil should not be kept high around the trees during the summer as this will force the borers to enter the trees at a higher point and consequently make them harder to kill. One point which must be remembered is that the soil temperature must be close to 60°F. and it is at this temperature or above from the latter part of May until about October 1st. These of course are average dates.

The method of application is about as follows. Pull away any grass or rubbish from about the base of the tree. If low, raise the soil level to normal, or if there are indications of borers four or five inches above ground, raise the soil level to that point. Have the soil reasonably smooth and firm. Remove any heavy exudations of gum. Next apply the paradichlorobenzene in a ring about one inch wide and about two inches from the tree, and cover with a mound of dirt four or five inches high and extending about a foot from the tree. This should be firmed with the shovel or spade.

We know now that paradichlorobenzene will kill nearly all borers with which it comes in contact but we do need a lot of information about using it on young trees and I hope to get some of this information next season but the College does not have available any orchard which can be used for such work. I would be very glad to hear from any grower owning peach trees from three to six years old who would be willing to take a little risk on a few trees for the sake of finding out more about the use of this material on such trees.

CONTROL OF BROWN ROT ON PEACHES AND PLUMS.

A common complaint from growers of peaches and plums has been that their fruit will not stand up after harvest so as to get it onto the market in good condition. This trouble is usually due to brown rot. During the last two seasons work to find a practicable remedy has been under way and very promising results have been gotten. The treatment has consisted of one or two applications of sulphur dust a short time before harvest. If one application is used it has been made one week to ten days before harvest and if two, the first one was made about one month before harvest. The usual early summer spraying of course was made regardless of the late treatment. The first work along this line was done in 1920 on Lombard plums on the farm of Mr. H. E. Hawley at South Haven. Very good results were secured there and they were given to this society last winter. This year the work was continued at Hart on Mr. George Hawley's farm with peaches and plums and at Fennville on Mr. P. H. Broe's farm with peaches. I shall give here in tabular form the results of the experiments. The general method followed was to select average samples from dusted and check plots which were entirely free from rot, pack and ship to East Lansing where the fruit was examined at the intervals given.

BROWN ROT CONTROL—GRAND DUKE PLUMS—1921

Treatment	Application	Picked	Brown Rot
Check	0	August 22	44%
Dusted	August 17	August 22	6%

BROWN ROT CONTROL—MONARCH PLUMS—1921

Treatment	Applications	Picked	Brown Rot		
			Sept. 7	Sept. 10	Sept. 12
Check	0	Aug. 30	1%	13 %	78%
Dusted	August 17	Aug. 30	0	2%	7%

The results with one lot of Lombard plums was not satisfactory. They were soft ripe when the dust was applied, which may have affected the results.

BROWN ROT CONTROL—WARK PEACHES—1921

Treatment	Applications	Picked	Aug. 10	Aug. 12	Aug. 13
Check	0	Aug. 9	5%	38%	82%
Dusted	July 28	Aug. 9	0	12%	——
Dusted	July 5 & 28	Aug. 9	0	0	10%

I consider the results with the Wark peaches very good as Mr. Hawley tells me that frequently they are unable even to get these peaches shipped before they rot.

BROWN ROT CONTROL—CHILI AND GOLD DROP PEACHES—1921

Variety	Treatment	Application	Picked	Brown Rot Sept. 13
Chili I (Young)	Check	0	Sept. 9	86%
	Dusted	Aug. 31	Sept. 9	28%
Chili II (Old)	Check	0	Sept. 9	64%
	Dusted	Aug. 31	Sept. 9	35%
Gold Drop	Check	0	Sept. 9	30%
	Dusted	Aug. 31	Sept. 9	9%

Weather conditions at the time the Gold Drops and Chili peaches ripened were very favorable to rot development. We do not think of a Gold Drop being susceptible to Rot but it went down badly this year. With the Chili peaches there was a decided difference in rot development before picking. No counts were made but on trees not dusted the fruit dropped badly while on dusted trees fruit remained on the trees for some time. The fruit for the holding tests was picked on September 9th and Mr. Hawley told me on September 21st that there was still considerable fruit on the dusted trees but none on the check trees.

The experiment with Salway peaches at Fennville ran through the entire season so as to get any information possible with regard to peach scab and this is the first time in several years of peach dusting that any scab has developed on the check plots and of course is the first information available in this state.

BROWN ROT AND SCAB CONTROL—SALWAY PEACHES—1921

Treatment	Applications	Picked	Scab	Brown Rot
Check	0	Sept. 24	18%	13%
Dusted	May 30 Aug. 16	Sept. 24	0.7%	3%

Holding Test

	Picked	Brown Rot		
		Sept. 26	Sept. 27	Sept. 28
Check	Sept. 24	15%	60%	100%
Dusted		0	2%	10%

The figures show that dusting gave very satisfactory control of both scab and rot previous to harvest and that the holding quality of the fruit was much better where dusted. Mr. Broe, who owns the orchard was quite sure that the dusted fruit was of higher color than that from the checks.

I feel very sure that continued good results will come from the treatment used this year but in order to be certain the work will be continued and enlarged next year so as to be tested in as many places and under as many conditions as possible. I have used only sulphur dust this year and dusting has several advantages for this particular use over spraying but I hope to find some old spray or develop a new one which will do the same work. This is specially desirable as there are many growers who do not have dusters now and do not care to add one to their equipment. I hope to include cherries, both sweet and sour, in the work next season and can see no reason why the same beneficial results cannot be secured with them. I have seen many sweet cherries rot soon after

harvest and this past summer it was not uncommon for whole cars of sour cherries to go down before reaching their destination and some treatment such as here described might have helped.

SUMMARY.

This report may be briefly summarized in this way:

1st. The pear grower has the choice of two methods of control for pear psylla, one of which is a dormant application for the hibernating adults and the other an application directed at the eggs just before blossoming. Either of these applications should be followed by one of nicotine sulphate after blossoming and one essential point to be kept in mind is that all spraying for pear psylla should be done *very thoroughly.*

2nd. Grape dusting has not given conclusive results regarding rot control because of the lack of an epidemic of rot. Nictoine dusts give promise of being successful against grape leaf hoppers but no recommendation is made at this time.

3rd. The work with anthracnose control indicates that the number of applications may be safely reduced but again definite recommendations are postponed.

4th. Further work will be necessary before any definite statement can be made concerning leaf spot control on plums. With cherries we have had one year of success with dust and one not so successful but with indications that if properly applied, it may be satisfactory.

5th. There is little doubt that a pre-pink application on apples will be very desirable for the control of scab, particularly with susceptible varieties.

6th. The work with cheaper forms of dust and with spreaders in spraying materials must be continued before any conclusive statements can be made.

7th. General comparative tests of dust and standard sprays this year on apples and pears have shown about equal control of scab but spraying usually gave better control of codling moth.

8th. The use of paradichlorobenzene must still be considered in the experimental stage but it may well be used with certain restrictions.

9th. The holding and shipping quality of peaches and plums was greatly improved by a late application of sulphur dust.

CONCLUSIONS.

In conclusion I wish to say that I do not care to advise any grower that he should dust rather than spray or vice versa, but am giving the results of our experiments and observations so that he may use them for what they are worth in making his own decisions. I may say that I think dusting is here to stay and has a definite place in orchard practice but just how much and for what it shall be used as a general practice is for each grower to decide according to his own conditions and needs

DISCUSSION.

Mr. Hutchins: Would it make any difference in the season of conditions in applying pre-pink spray?

Mr. Dutton: When pre-pink condition comes along you must know how long it is going to be before the blossoms would be in the pink.

Question: Would a certain application at this time, of strong substance damage the trees?

Answer: I could not tell you without first seeing what the trouble is. I really do not think, however, that an ordinary spray would hurt at this time.

Question: Is the affliction of the trees something in the soil?

Answer: Could not tell without seeing the trees.

Mr. Hawley: Were there apple orchards in Michigan that had perfect control of the codling moth?

Mr. Dutton: Yes, there were many of them, but they were all thoroughly sprayed.

Mr. Brooks: Would the dormant spray answer for the pre-pink spray?

Mr. Dutton: I will not recommend it at this time.

OFF-YEAR BEARING OF APPLE TREES.

PROF. E. J. KRAUS, UNIVERSITY OF WISCONSIN.

It is a fairly common idea among fruit-growers that the habit of alternate bearing is a fixed one and that little or nothing can be done to prevent it or to overcome it, when once established. True it certainly is that some varieties of apples and other tree fruits are very likely to assume this habit early in life, and continue in it for long periods of years, although there are many varieties which are notorious for annual production. Many varieties which are indifferent in quality and many other respects are grown commercially, largely because they possess this valuable trait, while other excellent sorts are discarded because of the fact that they strongly tend to alternate bearing. It is a matter of interest to recall that some varieties tend toward annual bearing in certain sections, whereas in others they bear alternately, though as a rule, any given variety is likely to behave in much the same way in widely separated regions; any differences in behavior being due to variations in cultural practices, in large measure. Even in the case of those varieties having pronounced tendencies toward alternation in bearing, such alternation is not likely to be shown in the first few crops produced; the tendency becomes intensified as the trees grow older and is most pronounced in the cases of those trees which are not under the highest state of culture, or are suffering from neglect. Furthermore, even though the alternating habit is pronounced, it is possible for one year of heavy bloom to be followed by another, in case there is a severe freeze, or some other climatic condition prevails which causes the death of a large proportion of the blossoms or buds to fall, during such a year of heavy bloom.

These facts last mentioned, and the fact that certain varieties which tend toward alternate bearing may be made to bear annually, lead one to suspect that the cause of alternate bearing is largely tied up with the state of nutrition of the trees, and that if this is the case, it should be possible, by learning something of the inter-relations of nutrition, growth and fruitfulness, to arrive at some knowledge as to the means of regulating them, so that there would be an annual production of flowers and fruit. This view is strengthened by the fact that when flowers or buds are removed from trees at a very early stage (certainly before the young

fruits have well set or have attained any size), another crop of buds is formed for the next year, whereas, if these flowers or young fruits are allowed to remain, far fewer, or in many cases no blossom buds, are formed during that season. The idea seems more probable also from the additional fact that alternate bearing has been experimentally eliminated by means of the application of fertilizers, proper pruning, and adequate water supply.

A number of years ago this matter of the relation of pruning and fertilizers to fruit-bud formation and crop production was discussed before this Society. The principles laid down then need but be reaffirmed at this time, to aid in an understanding of some of the causes of alternate bearing and some possible remedies for the condition. It was stated that the most outstanding facts relating to fruit production are: (1), that a tree should possess *not* the *greatest* number of fruit buds, but a *moderate* number of such buds of excellent quality; (2), that vegetativeness and fruitfulness are not antagonistic functions of a tree but are intimately associated and tied up with each other; and (3), that the production of the quantity and quality of fruit buds is associated neither with the greatest nor least possible degree of vegetativeness of the tree, but with a sort of midway condition. Before entering into a detailed discussion of these points, it is well to recall the fruiting habits of some trees.

There is no one thing more essential to a comprehensive understanding of the practices which can be applied to trees to induce or maintain annual bearing, than a knowledge of the fruiting habits of the trees themselves. Not only do the different kinds of fruits vary widely in this regard, but the different varieties of any given kind have their individual characteristics. It is not possible to go into detail here, except in the case of the apple. This fruit bears what are termed mixed fruit buds; that is to say, each fruit bud contains not only the young flowers, but also a young, laterally placed, vegetative bud which continues the growth of the spur in somewhat of a zig-zag line, from year to year. In this respect it differs from the cherry, whose fruit buds contain blossoms alone. During the year of blooming out of the fruit bud of the apple, this vegetative bud may (1), remain as a tiny pointed vegetative bud; (2), grow out into a twig of varying length; or (3), develop into another fruit bud. In this last case there would be annual blooming of the spur. As many as fifteen per cent of the spurs of Jonathan may bloom two or more years in succession, in this way. In most instances, however, a shoot with a vegetative bud at its tip is produced, and it is not until during the following year that this shoot forms a fruit bud at its tip; thus the spur blooms only every other year under these conditions. But, fortunately, fruit buds are not borne only on spurs; they are borne quite as frequently as terminals on long shoots varying from three to ten or more inches in length, and in many varieties, as lateral or side buds, as well, on such long shoots. Varieties vary a great deal in the proportions of the buds which they bear in one or more of these positions, some rarely produce any lateral fruit buds at all, others such as the Wagener, Transparent, and the like, may produce as much as ninety per cent of the first few crops from such buds, though later in life they may bear almost exclusively on spurs. Ben Davis is likely to bear many of its fruit buds terminally on rather long shoots. Some other varieties

bear almost exclusively on spurs. Many varieties which are well known as annual bearers produce numbers of lateral fruit buds, or many of the spurs bloom two or more years in succession. Of course, it would not be necessary that every spur should bloom every year in order to secure annual bearing of the tree. It would be quite possible, and in fact very desirable, to have part of the spurs bloom one year, and part the next, so that by an alternation of the blooming of *spurs*, the tree *as a whole* would bloom annually. This last condition would be particularly desirable if the blooms on established spurs were further supplemented by blooms from fruit buds borne as laterals, or as terminals on the growths of the previous season, and from new spurs developing on older wood.

Fortunately there are now available definite figures, which demonstrate the fact previously mentioned, that there is a direct association between short growth and fruit bud formation, and that the most abundant development of high quality buds is associated neither with the most rapid growth nor the poorest growth. These measurements have been made in Wisconsin, Ontario, Missouri, Iowa, and other localities. All tell the same story, and furnish the grower one means of judging what his trees are doing, or should be doing to insure fruit buds of good quality. These measurements show (1), that short growths, less than one eighth of an inch in length, are likely to have vegetative buds at the tips; (2), that long growths more than ten or twelve inches in length are also likely to have vegetative buds as their terminals, though in many varieties they may have lateral fruit buds developed on them; and (3), that growths of from half an inch in length to three inches in length are very likely to end in strong, vigorous fruit buds. Shoot diameter is as important as shoot length; sturdy, stocky growths being much more likely to develop better buds than thin spindling shoots of the same length, whatever that may be. It should be pointed out further that the longer growths, which bear terminal vegetative buds, are exceedingly valuable in bringing about annual bearing, for upon them within two or three years sturdy, vigorous fruit buds are almost certain to be developed. In many varieties they produce lateral fruit buds in the axils of the leaf during their first year, and they may bear fruits the second year. Thus they form an important part in the machinery of annual bearing, so important in fact, that in practice the attempt should be to cause some branches to grow so vigorously that they will not remain as spurs, nor produce an abundance of fruit buds during the year of their greatest growth, but will delay such production until the year following, when other shoots will be caused to grow vigorously, and so on. Varieties differ in regard to the exact amount of growth that is associated with the various types of buds that it is possible for them to produce, but the general proposition holds as given above.

Valuable as these figures are, they would be of little significance, however, if it were not possible to relate them to conditions of nutrition and the materials concerned in it, so that there would be some knowledge available as to the means by which the type and lengths of growth desired could be produced at the will of the fruit-grower. Fortunately, such information is available, and though it has been presented to you several years ago, it may be repeated. As will be shown, although the very short shoots and the very long shoots both end in vegetative buds, such buds are quite different in quality in the two cases, and are associ-

ated with very different relative quantities of the several kinds of food substances in the shoots which bear them. A still different relation of these foods results in the intermediate shoot and fruit bud. A knowledge of these facts aids in simplifying the problem, even though it is by no means finally settled and much further work is required on it before all the suggestions made here can be proven with scientific exactness. The only excuse for presenting them at this time is because they have proven helpful toward an understanding of the results of orchard practices, and have aided in eliminating several which were expensive and wasteful, without securing the desired results.

For growth and development trees require many substances; some from the soil, some from the air. Of the soil materials nitrogen is the element which is most quickly exhausted in most regions, though there are localities in which potash, phosphorus, lime, or even other elements such as iron, must be applied to make up the deficit of the soil. The air elements are present in the same quantities everywhere, but the ability of the plant to secure them depends very largely upon its leaf surface. What later use is made of the foods made from the materials of the air depends upon the water and mineral materials of the soil (particularly nitrogen). It will be obvious at once that pruning becomes a means by which the intake of these food materials, the storage of such foods, and the utilization of them may be profoundly modified.

But first to consider the form or condition a plant assumes when some of these materials are available in different proportions. The effects of variations in the amounts of carbohydrates (substances such as starch, sugar, and the like which are built up by the leaves from some of the constituents of the air) in relation to the available nitrogen supply will be pointed out. It must be assumed that water and other needful materials are available; if they are not, of course the behavior of the plants and the conditions obtaining within them would be entirely different from those indicated here. But to suggest the classes of growth and behavior possible when the carbohydrate and nitrogen supply, or reserves, are related to each other:

1. A strict limitation of carbohydrates, through shading (inside of dense trees) or excessively heavy pruning, though there may be an abundant supply of nitrogen in the soil, results in (a), weak, stunted growth; (b), no fruit buds.

2. An abundant supply of carbohydrates, and an abundant supply of nitrates and water (as in moist, rich soils), heavy fertilization, and a moderate amount of pruning or none at all), results in very vigorous growth, no fruit buds, or a few scattering ones which are likely to fall without setting, or if they do set, the fruit is oversize, punky, and poorly colored. Young trees on good soil belong here.

3. An abundant supply of carbohydrates, with a restriction of the nitrogen supply, more than in Class 2, so that carbohydrates tend to accumulate, results in some sturdy vegetative extension, strong, high quality fruit-buds, fruits of good size and well colored. Young trees bearing their first crops, more mature trees carefully pruned and fertilized, belong here. This is the desirable commercial condition.

4. When there is a marked restriction of the available nitrogen, carbohydrates accumulate in excess. This condition results in weak buds and very short growths. If not extreme, many flower buds are

produced but they are weak, and exceedingly high percentage of them fail to set fruit. The leaves are yellowish, the shoots of small diameter, yellowish brown, and brittle in texture. At first glance the condition of small weak buds resembles that of Class 1 above, but it is actually due to the reverse relation of materials, and hence it must be corrected through different practices. Trees are very likely to go into this class 4, as they grow old and exhaust the soil about them. Here also belong most of the trees in old neglected orchards.

Naturally these classes grade into one another, and it is entirely possible for any tree to be forced through all of these classes during its life time, depending upon the orchard practices followed by any particular grower. In fact as a tree grows older it would naturally drift through the last three, at least, and parts of it would be subjected to the conditions in Class 1, especially if very heavy pruning were given. And yet, if these classes are accepted even in a broad, general way, it is possible to suggest cultural practices to correct difficulties or to maintain desirable conditions, after any particular situation has been classified. But before giving these means of practical regulation of tree form and productivity it is well to relate the classes of growths and the buds they bear, to the classes above enumerated. The short growths bearing vegetative buds could fall either in Class 1 or Class 4. Usually they are of the Class 4 type if the trees are old, but of the former if the trees are younger, and have been much overpruned. The long, vegetative shoots, bearing vegetative buds, are obviously Class 2, while the shorter sturdy growths bearing fruit buds are Class 3, which ranges from Class 2 to Class 4 on either side.

If these types of growth and of materials can actually be related in this way, and it seems very likely that such a relation does exist, then the next consideration is, how can these types be produced or maintained in practice? Two obvious means present themselves: (1), the application of fertilizers, and (2), pruning. A study of the classes indicates how these two practices should be used. Neither can be dispensed with, if the soil is of such character that nitrogen exhaustion is possible. It would be perfectly possible to force trees from Class 4 to Class 3 through pruning alone, balancing off the carbohydrates against such nitrogen as might be available. But such a system is wholly one of substraction; one of addition of some form of nitrogen to the soil would be far wiser—for in that way the materials available in the tree are utilized in crop production instead of thrown away, and furthermore, the possible bearing area remaining is much greater. Would then, fertilizing alone, without pruning, be advisable? Again no, since attention must be given to the form of a tree, and the additional very important fact, that many trees tend to grow most vigorously only at the tips of the branches if unpruned, so that the fruiting region under such circumstances migrates further and further away from the center of the tree, towards the outside. The most valuable, strong scaffolding comes to be bare of fruiting wood. Varieties differ greatly as to the speed at which this migration of the fruiting wood to the outside of the tree takes place, and the readiness with which younger or renewal growths naturally form near the center of the tree, or in the open spaces on the larger branches. In any case, however, with most of the fruit at the outside of a tree, even a small crop is capable of causing breaking.

Pruning is one of the most important means for bringing about a distributed condition of growth and productiveness. In fact a rule of pruning is that "the greatest influence of a pruning cut is manifested in the vicinity of that cut, though some influence is exerted throughout the tree as a whole." This should certainly indicate to every wise fruit grower, that a pruning which consists of many small, distributed cuts, is better than one which consists of a few very large cuts, the making of which may seem to require less time.

In like manner trees can be changed from one class to another. Class 2 trees, with light pruning, will go into Class 3, as a larger top accumulates, unless at the same time larger quantities of nitrogen become available, or are applied. Or on the other hand Class 3 trees could be made to correspond to Class 2 with heavier pruning, or through very heavy fertilization with materials themselves high in nitrogen or promoting the accumulation of nitrogen. So too over-pruned trees in Class 1, on good soils, could soon be brought into the other classes by less cutting. Individual branches or shoots could be made to grow more vigorously or less vigorously than their neighbors, by adjusting the amount of pruning given them, balancing one off against another.

But to apply all this more directly to the matter of alternate and annual bearing. If the trees are in a condition similar to those of Class 4 it would be well to apply some fertilizer carrying nitrogen. This may be stable manure, leguminous cover crops, or commercial fertilizers. Often the application of nitrate of soda, or of sulfate of ammonia at the rate of from 2 to 5 pounds per tree, depending upon its size, when the fruit buds show green between the bud scales, will produce excellent results in increased set and yield, (if any fruit buds are present), as well as greater vegetativeness, during the year of such application. Along with these applications of nitrogen should go a moderate, distributed pruning, one consisting of the removal of a few branches where the growths have become very dense, and a thinning out at other places, to encourage considerable growth among the older clusters of spurs, and to bring about the growth of some branches sufficient to throw them into the class of long branches which produce mainly vegetative buds during the year of their greatest growth. Many such long branches will produce fruit buds the following year, or they may produce lateral fruit buds during the first season of growth. The amount of pruning to be done naturally will depend upon the size of the tree, the crop it is likely to produce, and the amount of fertilizer which has been, or is to be applied. All these factors work together, and it is not best to try to secure results through one method, alone.

Theoretically this treatment could begin either in an "on" or an "off" year, but both the pruning and fertilization would vary in amount or degree, in the two cases. It should be remembered that the object striven for is not the production of the greatest possible number of buds, but rather about half or two thirds of the possible number, whereas the remaining spurs and growing shoots will carry over in a vegetative condition. So then, if the treatment is to begin in an "on" year, the fertilization should be heavier than in an "off" year because not only must there be a production of much greater vegetativeness of the shoots but also a further development of many fruit buds already present. Likewise also, fruits themselves must be developed, and they require

much the same materials for their growth that the branches demand. Especial care must be exercised in the pruning, to see that the cuts are made in many places throughout the tree so as to encourage a stimulation toward shoot development at many points. If the tree is a very large one, the pruning may be fairly heavy, but in no case should anything even approaching a "dehorning" be given. If the tree is smaller, the pruning should be rather light, except for such cuts as may be needed to correct bad form. Remember that the pruning is to supplement fertilizers and cultivation, that it can not profitably replace them, and that it is mainly to aid in distributing the responses which come from those practices. Pruning of any kind is generally, though perhaps not always, a subtractive process. But it is none the less an exceedinlgly valuable means of directing tree growth and production, and is very nearly an indispensible one in modern fruit growing.

If the treatments of alternate bearing trees are begun in the "off" year, the same general practices are available as before. In the "off" year the alternating trees usually form very large numbers of fruit buds, in some cases an exceedingly large percentage of all the buds on the tree are developed as fruit buds. This is a bad condition, since it results in a very heavy bloom the following spring, which is usually followed by a heavy fall of flowers which fail to set, and a large crop of fruit. All these occurrences lead to a depletion of the reserves of the tree to the extent that few or no fruit buds are formed during the year of bloom. Instead then, of allowing the tree to produce the maximum number of fruit buds during the off year, the tree should be stimulated to greater growth, a growth sufficient to force a fairly large percentage of the shoots into the longer, more sturdy class which remain vegetative. But this can be done with less nitrogenous fertilizers during the "off year" than during the "on" year, since there is no crop of fruit buds or of fruit on the trees, which would take up a part of the nitrogen. The distributed character of the pruning and its degree of severity should be much the same as if done during the "on" year. Even a light pruning during the "off" year, accompanied by fertilizer applications, will produce marked vegetative responses.

The discussion in the two paragraphs just preceding has related to trees growing in a soil deficient in nitrogen. If nitrogen is not deficient, then bearing can be regulated almost entirely by pruning alone providing the moisture supply is adequate. There are plenty of orchards the country over, which are annual bearers. The owners of some of them have not even troubled themselves to fertilize, prune, or cultivate them, and yet they are successful commercially. The factors of the environment are so nicely combined that year after year these trees grow well and produce well. Unfortunately however this is a rare condition, and many orchards which in their younger days appeared to be in this class, now require much closer attention. The number of older orchards, however, which up to the present time, have not required commercial, or organic fertilizers, is fairly large. Most of these require pruning to maintain good form and profitable bearing, but in general such pruning has been more severe than necessary. In addition this pruning has often been confined to a few large cuts on the tree, resulting thus in the uncut parts of the tree remaining much as they were before the pruning was done, while other parts have actually been pruned so severely that

they are impoverished in food reserves, and have been thrown below the desired, balanced condition of good growth and abundant fruiting.

After the conditions prevailing in alternating bearing have been broken up, the problem of keeping the trees in the state of annual production still remains. It has been found in Oregon and elsewhere that the effects of a heavy application of nitrate of soda, or of sulfate of ammonia are shown by the tree not only during the year of its application, but during one or more years thereafter. The prolonged effects of a single application of organic fertilizer through a period of years is also well known. The fertilizer materials, or products formed from them, are carried over both in the soil, and in the trees. Naturally this means that applications of fertilizers during succeeding years, after the first one, must be gauged by the extent of these "carry over" or hold over effects. It is perfectly possible to cause a tree to go from Class 4 to Class 2 within two years by over fertilization, and even to Class 1, by over pruning. It is quite impossible, however, for anyone to make any general recommendations on the amount of pruning to be done, or the amounts of fertilizers to be applied each season, without carefully noting the condition of the trees, and the amount of the crop previously produced, or likely to be produced. This the fruit grower himself is in the best position to do.

It remains to say that length alone is not the safest guide for judging the conditions of the trees. To note the diameter of the growths produced is quite as essential, for there are many of the longer, twiggy growths, which are of very little value as future fruiting wood. But the sturdier shoots do furnish a rather helpful index to growth and fruiting conditions. By becoming familiar with them, by knowing the fruiting habits of the varieties grown, by trying to recall the classes of growth, and the probable substances to which such growth and fruiting behavior are related, and then remembering the means by which these substances can be increased or decreased in commercial orchard practice, the fruit grower becomes his own best counselor and has a surer and safer guide toward profitable fruit growing than without such information at hand.

DISCUSSION.

Mr. Brooks: Would it be all right to apply Nitrogen to crop two or three weeks before blossoming, and another after blossoming?

Dr. Kraus: If you should put on one application and it should be followed by a heavy rain, the material would be washed out by the rain and part of it would be lost. But the great trouble is generally found that the application has been made too late, and I doubt very much if you could get the same good results with the second application that you could with the first. If you could get Nitrogen in early, when these buds are just developing, you get a much greater value for the money put in them. In the second application it is held over and will show in the succeeding crop. This reserve is carried over inside of the tree and is used in the crop the succeeding year.

Question: How early would you advise putting on the Nitrogen?

Dr. Kraus: Our best results have come from applying the nitrogen when the fruit buds show green between the bud scales.

Question: How long would you say it was advisable to apply one fertilizer year after year?

Dr. Kraus: If it is a factor that is being constantly used up, doubtless it should be continued more or less indefinitely as long as it goes into the tree. It means that at least after a year or two the trees are growing ahead of themselves and you will need to supply a supplement to the Nitrogen. In order to get the full value of the Nitrogen we have to begin adding these other materials to it. If we put on too much Nitrogen it will make the trees "overgrow" themselves.

Question: Does this discussion apply to cherry trees?

Dr. Kraus: Yes. If cherry twigs are very short, the tendency is to produce a leaf bud at the tip. The cherry buds are all blossoms. When fruit is taken off it leaves a bare shoot. To go on for ten or fifteen years the twig will be walking out continually and will be a long line. Buds produce cherries and are vacant second year, then the twig will walk out a little farther and produce a leaf on the end.

Question: How may we eliminate bare spaces—what do you consider good growth on twelve year old trees?

Dr. Kraus: 9 to 10 would be better. The only thing would be to prune. Prune from the top.

Question: Have you ever known leaves or fruit spurs on bare twigs where the leaves have been lost, by shothole fungus?

Dr. Kraus: No.

Question: Would you recommend applying stable manure to it?

Dr. Kraus: Yes.

Question: Would this time of the year be the proper time to apply it?

Dr. Kraus: No, you would lose too much by leaching.

Question: Would the same thing as far as time of application is concerned apply to commercial fertilizers?

Dr. Kraus: No because commercial forms go into solution so quickly.

Question: In developing annual bearers would you prune on the "on-year" or the "off-year"?

Dr. Kraus: On the "off year".

Question: What would be the best way to prune peaches—to high top or low tops?

Dr. Kraus: Does not make any difference.

Question: Will trimming have any effect upon the bearing of fruit the following year?

Dr. Kraus: No—because the trimming is done too late.

Question: I have a Spy orchard too close together and it affects the growth. What would be the results of trimming the ends of those longer limbs?

Dr. Kraus: If you cut off limbs, it allows the others to have more light. The buds would grow stronger. If the branches are tending to be too thick, you would disappoint that effect by cutting. The buds would be stimulated. The tendency would be to grow back into vegetating shoots. You can use pruning shears.

Question: Do you find any difference in June and Spring pruning?

Dr. Kraus: Yes—in case of spring pruning you will tend to remove reservations that are held over winter. If you begin in June you will remove that material which you would remove in winter time and you tend to starve the thing out. June pruning is weakening to the trees.

Question: Will the pruning of young orchards tend to keep them from coming into bearing so early?

Dr. Kraus: First it divides itself into the question—are these permanent trees or filler trees? If they are filler trees, unless I can get them to bearing something within six years, I better not have them. If they are permanent trees, I can allow them to go eight years or so before I should get fruit.

Question: What do you think about pruning cherry or apple trees after the crop is picked?

Dr. Kraus: It is too early. Branches are still storing their food material in the spurs and twigs.

DECEMBER 8, 1921.

FORENOON SESSION.

ADDRESS.

R. C. BUTNER.

SUPERVISING INSPECTOR FOOD PRODUCTS INSPECTION SERVICE, U. S. D. A. CHICAGO, ILLINOIS.

The Food Products Inspection Service was first established by an act of Congress, approved August 10th, 1917, as a war emergency measure. At that time it was believed that if some protection would be offered to shippers by providing an inspection service in the markets for their benefit it would result in stimulating agriculture. The law authorized inspectors to certify to shippers the condition as to soundness of fruits and vegetables when received in important central markets designated by the Secretary of Agriculture. Under this law we had no authority to make inspections at the request of the receivers, although during the war a large number of applications for inspection were made by the Food Administration and many of the applicants were indirectly at the request of the receiver. The work was limited to certifying condition as to soundness and the certificates issued were of little value in settling disputes or claims for allowances in which the question of grade or quality was a factor. The Agricultural Appropriation Bill, approved Oct. 1st, 1918, carried an item for the continuance of the Food Products Inspection Service and this law authorized inspectors to certify to shippers and other interested parties the quality and condition of fruits and vegetables when received in Interstate Commerce at the important central markets. In the beginning the work was performed free of charge but since Oct. 1st, 1918, fees have been charged for the service. Congress has continued to make appropriations for this work from year to year and it now seems destined to become a permanent feature of the activities of the Department of Agriculture.

The present law authorizes inspections of fruits, vegetables, and other perishable farm products when received in interstate commerce at such important central markets as the Secretary of Agriculture may from time to time designate, under such rules and regulations as he may prescribe, including the payment of such fees as will be reasonable and as nearly as may be to cover the cost for the service rendered: Provided, "That certificates issued by the authorized agents of the Department shall be received in all courts of the United States as prima facie evidence

of the truth of the statements therein contained." We have no authority to make shipping point inspections of interstate shipments, nor can we make inspections at markets other than those which are designated by the Secretary of Agriculture. Shipments which are in the course of interstate movement may be inspected at a point in transit which is designated as an important central market. Concretely expressed the Long Island potato grower cannot have his shipments inspected in New York City and the Michigan Potato Grower is not entitled to receive U. S. inspection for his potatoes shipped to Kalamazoo, Grand Rapids or Detroit, unless they are billed to a point outside the state. This restriction in the law has hampered the work to a considerable extent in several of the larger markets and if we had the authority to inspect intrastate as well as interstate shipments the service would be of greater value to both shippers and receivers.

Perhaps it may be well to mention the fees and the rules and regulations regarding the issuance of certificates. The original or ribbon copy of the certificate goes to the applicant who pays the fee for the inspection. One copy of the certificate is mailed to the shipper if he is not the applicant. For additional copies of certificates requested by other financially interested parties the fee shall be $1.00. The applicant may secure two copies of the certificate free when specifically requested before the issuance of the original certificate. For each lot of food products inspected the fee shall be as follows: $4.00 when the quantity involved is more than one-half of a carload, but not more than a full carload; and $2.50 when the quantity involved is not more than one-half of a carload. Prior to July 1st, 1920, the fees were $2.50 for carlots and $1.50 for small lots. The increase in fees was necessary in order to more nearly cover the cost of the service, and in this connection, so far as we are able to judge the amount of work performed has not decreased on account of the increase in fees. The fees which are charged, however, only partially cover the cost of the service, and besides, they do not come back to the Inspection Service. The receipts go into the miscellaneous funds of the U. S. Treasury and are not converted into a revolving fund from which we could draw to extend the service as the needs justified.

Probably most of you are familiar with the general nature of our work, our certificate form and the way we are reporting our findings. The purpose of the certificate is to furnish a fair and impartial report which can be used as a basis for the settlement of disputes. In most cases our certificates cover inspection of cars which have been rejected or else were accepted with the understanding that an allowance would be made, provided the report showed that the shipper did not deliver the grade or quality specified in the terms of sale. The certificate will at least be proof whether the stock was graded as he marked and billed it and serve as evidence of its condition on arrival. The advantage of this up-to-date knowledge of the condition of the shipment is so evident that many shippers and receivers ask for inspection as a matter of precaution. The small fee charged is inconsiderable if it tends to prevent any misunderstanding or suspicion of unfairness on either side.

Another feature of our work has been brought about by a number of carlot distributors who have availed themselves of the opportunity to use our certificates for sales purposes. In the language of a prominent official of the Interstate Commerce Commission our inspection certifi-

cate presents "a visual picture of the exact condition of the shipment at time of inspection." With the shipment officially inspected the interested parties have learned all that it is practicable to know about its condition and grade and many causes of later disputes are removed. It removes much of the worry and uncertainty and narrows the market question down chiefly to a matter of salesmanship. When the exact quality and condition of the product is known the buyer and seller can get together regardless of distance. The same certificate which is used for sales purposes is often used as a basis for settlement in case of dispute between the original shipper and receiver. These certificates serve a double purpose and are very useful to all parties concerned. The quantity of work performed in inspecting cars in transit for sales purposes has shown a steady growth during the past year and has become an important feature of our service in a number of markets.

Our certificates have been criticised because we named the disease and did not simply call it a rot. I have heard men argue that it did not make any difference what kind of a rot it was, one is as bad as another if it destroys the product for commercial purposes. Perhaps that is true but if we name the disease, we may help to locate the cause of the trouble, whether the disease originated in the field or developed in transit. We feel that it is of the utmost importance to give the name of the disease and by so doing the shipper may be in better position to understand why his shipment arrived in poor condition. If it was due to careless handling, he would no doubt improve his methods by having this matter called to his attention. If it was an orchard disease he could take control measures to prevent its recurrence during the next season. We seldom know the purpose for which a certificate is to be used and for this reason we have adopted the policy of stating all the facts which are necessary to furnish a complete description of quality and condition. Our certificates should recite all the facts so that they will go back to the producer and by so doing assist in improving the methods of handling perishable products which is one of the things for which we are working. Railroads are now using the service to a large extent in order to obtain all the information necessary to arrive at a fair settlement in the event of a claim for damages. Therefore, we must examine the product and state all the facts relating to quality and condition, without considering whether it is to the advantage of any particular interest. The certificate can be useful in so far as it recites the exact truth as nearly as it can be stated and in the end this is the type of service that will be helpful to everybody.

The inauguration of the Food Products Inspection Service has developed a phase of plant pathology which hitherto has been touched only casually by pathologists. This is the field of market pathology as contrasted with that of production or field pathology. Those who were in charge of the work in the beginning saw the desirability and necessity of cooperative work between the Bureau of Markets Inspection Service and the pathologists of the Bureau of Plant Industry. This cooperative work provided the opportunity for pathologists to survey conditions in all of the larger markets of the country and to study diseases economically important in fruits and vegetables, after the harvest, whether in the field, in the packing house, in transit and in storage. One of the outstanding developments of this cooperative investigation is a surprising

revelation of the enormous annual loss of fruits and vegetables due to disease during transit. The certificates sent in by inspectors covering the inspection of 56 cars of pineapples during the past season show an average loss of 27% from Black Rot. In one week as many as 2,500 hampers of Louisiana head lettuce had been rejected as a total loss at the car door in Chicago. In the year 1920 out of 1,298 cars of peaches inspected 1,065 showed Brown Rot and the average loss in those cars was about 20%. It is estimated that 25% of all tomatoes shipped from California, Florida and Mexico into distant markets are discarded because of decay. Inspection of 750 cars of barreled apples and 816 cars of boxed apples of the 1920 crop shows an average loss of 12% due principally to Blue Mold Rot and scald. Some of these losses could have been prevented, especially the loss from Blue Mold Rot, which is usually the result of careless handling methods. Up to a short time ago the majority of those who deal in fruits and vegetables accepted these losses as a part of the game. The business or rather the industry as a whole and ultimately the consumer absorbs the loss which amounts to millions of dollars annually.

Dr. G. K. K. Link one of our pathologists has summed up the situation as follows: "From an economic point of view it is a hopeful sign for all concerned and augurs well for the future, that the contact established with shippers, receivers and the railroads are bringing to them the realization that such losses are due mainly to plant diseases, many of which are controllable, and not to "inherent weakness." When the buyer and distributor once realize that their losses are mainly due to diseases, they will insist that a sound, disease-free product be delivered to them. This will lead to improvements in production methods such as the use of disease-free seed, seed disinfection, spraying and field sanitation, since the grower must grow what he can sell. So long as he can sell inferior, unsound diseased products there is no incentive to produce high-grade, disease-free stock."

Equally important is the marked improvement in market conditions which has prevailed since the inspection service was established. In the past it was not uncommon for cars of produce to stand on track for several days and often a week or more, while the shipper and receiver wrangled over the settlement. One of the results obtained by official inspections is the prompt settlement of disputes and unloading of cars. Not only have enormous sums been saved in car demurrage but the prompt unloading of cars at destination has aided the railroads in furnishing cars at times when their failure to provide the necessary equipment would have resulted in heavy losses to shippers of perishable products. The rejection of shipments by unscrupulous dealers on some trifling excuse has often thrown cars of produce on the market at such prices as to demoralize it and prevent other dealers from making the profit to which they were justly entitled. This does not happen so frequently now as it did in years gone by and conditions seem to have changed for the better. The inspection service alone is not responsible for all of the improvements but it has contributed a large measure towards eliminating conditions that tend to cause waste and injury to the producer, buyer and consumer. It has assisted in overcoming many of the difficulties arising between seller and buyer, making the negotiations more pleasant and profitable to them both.

Grades have been established for the more important products and this has had a direct influence on the betterment of market conditions. In the early days of the inspection service it was evident that grades were needed. Not only was there a need for grades to be used as a basis for making the inspection but there was a nation wide demand on the part of growers, shippers and dealers for definite grades—a common language to provide the basis for more intelligent marketing and a better understanding as to the meaning of terms used in trading. Unjustifiable rejections of shipments on account of a decline in the market is the shipper's nightmare just as enforced acceptance of poorly graded products is the bugbear of the receiver. The answer to the whole problem is definite practical grades. When shippers furnish products of standard quality and receivers are willing to enter into contracts on that basis the business of marketing farm products will have reached the goal towards which it is marching.

In 1915 the Bureau of Markets inaugurated a telegraphic market news service on fruits and vegetables. It was soon realized that it was very difficult to report market prices unless they are based on definite standards of quality. Potatoes may be $3.00 a hundred in N. Y., $2.00 in Chicago and $2.50 in Pittsburgh but unless the grade of these potatoes is known there is no means of determining which is the better market. Thus potatoes received the first consideration by the investigators of the Department in the matter of marketing potatoes by grade and by the time the U. S. entered the world war the Department was in position to make recommendations as to what the grades should be. Shortly thereafter the Department of Agriculture and the Food administration jointly recommended the U. S. Grades, the use of which, on Jan. 31st, 1918, became compulsory as far as the licensees of the latter organization was concerned. It was about this time that the Food Products Inspection Service was organized. The potatoe grades soon became prominent and enabled the inspectors to determine accurately what shipment conformed to the prescribed standards and what did not. The reports furnished a basis for settlement of disputes between shippers and receivers and enabled the U. S. Food Administration to make proper adjustments in cases of disputes over quality or condition.

The U. S. Potato Grades became so well established during the war that they were used voluntarily by the Trade thereafter. Today the grades are the official standard in nine states which represent 25% of the total production of the country and in addition are being generally used in practically every other important producing section.

Grades have also been recommended for Bermuda Onions, Northern Grown Onions and Sweet Potatoes. Tentative grades have been prepared for tomatoes, asparagus, strawberries, cabbage, head lettuce, celery, cucumbers, peaches and barreled apples. When one considers the chaotic condition which prevailed prior to the inauguration of the Inspection Service there is certainly room for encouragement in reviewing the work of the past four years. It would not have been possible to develop the inspection service to a high degree of efficiency without definite grades—and on the other hand the inspection service has helped to determine the practicability of grades. Grades and inspection are inseparable, the two go hand in hand and each is dependent upon the other.

Federal inspection began in Nov. 1917 and the work has gradually increased from year to year in response to increasing demands. The steady growth of the work is apparently limited only by the facilities available. Total inspections for the last Fiscal year were approximately 24,000. For this year our appropriation is 175,000 and with this amount you can readily understand that there is a limitation on the number of markets to which the service can be extended. Inspection offices are established in about 30 of the largest markets. We receive a great many requests to extend the service to additional markets and we believe that there is sufficient demand for the service to warrant the opening of a number of new offices. We should like very much to extend the service to some of these markets but this cannot be done with the funds available for this year's work. At the present time we have about 50 inspectors and during the past year we could have well used at least 70 to 75. It has been necessary to decline a large number of applications for inspection both in the smaller markets which are served by the larger markets and in some of the markets where a force of 5 or 6 inspectors has been unable to supply the demand for the service.

You may be interested in knowing the proportion of inspections made at the request of shippers, receivers and the railroads. Figures for last year's work are not available but as a general rule about one-fourth of the inspections have been made for the railroads. Nearly the same proportion were made at the request of shippers and the rest were asked by for receivers, although many of the applications were indirectly at the request of shippers.

The value of the inspection work can be better realized when you keep in mind the fact that in the case of most of the 24,000 shipments inspected last year there was some dispute about the sale and a basis for adjustment was needed. The certificates issued by giving a statement of facts which described the quality and condition of the products, made possible in most instances a just settlement of the difficulty. We have not pleased both sides in all cases, and it has worked both ways as will appear from the following statement made by the sales manager of a large organization, "The buyer can always find fault with the shipment and the shipper is never willing to agree that his shipment is of poor quality; your reports are fair and impartial, and since they come from a disinterested source both sides are beginning to realize that they are more dependable than reports from any other source."

You as shippers should also remember the fact that a government inspector serves you even though no inspections are made. Undoubtedly many unjust rejections and claims for allowances have been prevented simply because it was realized that the shipper had the right to ask for government inspection which would show an impartial and accurate report of the quality and condition of a shipment.

I wish to emphasize the fact that no matter who asks for the inspection we have only one kind of certificate to issue—that is based on a statement of facts, without considering the particular interests of anyone. We do not have one kind of certificate for the railroads, another for shippers, and still a different kind for receivers. There is no axe to grind and we are not working for any particular interest but we are trying to serve the best interests of all and our efforts are devoted to placing the produce trade in general upon a sounder and better working basis.

ORCHARD MANAGEMENT.

THOMAS SMITH, CHICAGO, ILL.

Some people think that if a man can grow fruit or is a successful business man he ought to be a successful speaker or most anything else. That is not true in my case. I think I would be considered a successful fruit grower.

I have largely learned from the contact with you men and have taken a cue from the way you have succeeded and tried to put in practice in my own orchard the practical things I have learned. I have also learned from the failures.

If there is any one business that needs to follow out the scriptural text—"Whatsoever you see to do with your hands do it" it is the Fruit Growing Business. You have to put your whole heart into it—be slow and careful and hurry up. I do not know of anything that is as interesting as is the growing of fruit and no man can succeed unless he did love it. If I get a man that does not love what he is doing, I can't get very far with him. Don't try to get a talker or a fellow that is over-wise, but a good, conscientious fellow.

There are two orchards about 26 miles apart.—They have nothing to do with each other and the two orchards are on a par as far as perfection is concerned in the growing of fruit—in fact I believe the men have somewhat of competition between themselves. They are 90%—one place we have 1,900 barrels and only 40 crates of culls which were mostly undersized, or had the skin broken.

No one has a monopoly on the Fruit Growing Business. I think there are some things in the spraying we have learned by experience and failures. We think a good deal of Bordeaux. After the blossom falls we use about three pounds of vitrol and about six of lime to fifty gallons of water. One orchard where I knew there was a little scab, and I was afraid the spray wouldn't help, we furnished the Bordeaux and poison and we got the worm just the right time. That convinced me that the Bordeaux in the summer mixes better with the poison. Another orchard that we continued to spray with the lime sulphur, we found quite a few worms there.

I believe we are just beginning to understand how to fertilize and its value. I do not care much about the gun—I like the old bamboo pole with a couple of nozzles. One orchard we sprayed six times and we had a little over 8,000 barrels of apples this year.

I am no great hand to trim trees closely. I like to take out the water sprouts. I do not cut the tops out, for I believe that takes out just that much of the good bearing surface.

There is one orchard in New York that is 65 years old and it produced 60,000 barrels this fall.

I believe it is a good thing to get nitrate of soda and put on the trees before they blossom out. The apples are large and foliage fine.

Phosphate helps to make buds, and I believe that the Bordeaux helps to preserve the fruit. We think that it sometimes helps to keep the color in storage.

Mr. Smith then asked the people if there were any questions they would like to ask. I believe we can grow apples in Michigan with the finest flavor in the world. We should mark our barrels in some way.

Question: What do you do for rust—are you ever troubled with it?
Answer: Use five pounds of Vitrol to 50 gallons of water and six or seven of lime at the same time.
Question: Do you use hydrated lime?
Answer: No, barrel lime.
Question: Where should we buy our nursery stock?
Answer: I have bought from Michigan successfully and Iowa and Illinois.
Question: Should you get nursery stock from Michigan for Michigan locality?
Answer: Not necessarily—just so you do not go too far South.
Question: Can you grow the Greening in Michigan as well as in New York?
Answer: You get a little better color in Michigan.
Question: How about cultivating and fertilizing?
Answer: It is a good thing to cultivate and turn under clover or rye. Be careful in plowing—should be plowed very shallow. I always disc in clover and never plow if I can help it. Never plow more than three or four inches.
Question: What kind of clover do you use and when do you seed it?
Answer: Generally medium red clover and seed about the first of July.
Question: Tell us about that Walkerville Orchard.
Answer: We keep four or five men. There are fifty-two acres in the piece. Some young trees and around forty-two acres of older trees. Two years ago I bought a balanced fertilizer containing potash and all the other good stuffs we could get in it. It aided the crop that year and made buds this last year; 6,000 barrels in 1920 and 8,000 barrels in 1921. We believe there was a good deal in the fertilizing in the spring. We put on potash and phosphate 10–10. We think that aided in making a good color.
Question: Do you think we need any iron in the soil?
Answer: You will find better color on the apples in iron soil. There is a sulphate of iron, but I have never tried that. I know potash and phosphate will give color and will ripen your fruit a lot earlier.
Question: Have you used any bone meal?
Answer: No.
Question: Have you used the dust for a spray?
Answer: No.
Question: Do you fall plow?
Answer: I think it is all right but I would rather plow in the spring. Would rather disc than plow.
Question: How about the use of props?
Answer: We use props on some overloaded trees.
Question: Does it help to hold them up where they will color better?
Answer: No, I would not use props unless I had to.
Question: You spoke of using advertising matter in the barrels.
Answer: Yes. I think we are away behind the times and some young fellow will come along and back us off the map. We should tell the people the facts about Michigan fruit by putting some kind of literature in the barrels. The grocers will hand them out. We should advertise.
Question: Do you thin the apples?

Answer: Sometimes, when we can. One tree had thirty-two hundred underneath it and we still had a plenty left. These were Wealthys.

Question: Would you plant Tolmans?

Answer: There is a certain trade that like an early sweet apple. I would not try to grow novelties, but you can't go wrong on some standard grade of apple.

Question: What do you think of the Bailey Sweet?

Answer: It is not a real commercial apple. If you want a sweet apple you ought to plant something that comes earlier.

Question: What varieties do you have in the 65 year old orchard in New York?

Answer: We have the 20-ounce Pippin, the Red Baldwins and Greenings.

Question: Does the 20-ounce Pippin bear in Michigan as well as in New York?

Answer: Not quite as well in Michigan, but I would not hesitate to plant some. Don't go too far North with them.

Question: What about the Russet?

Answer: The Russet is a very good apple, but does not commence to bear very early.

Question: What about the Wolf River?

Answer. They are a good apple and something that is on the market quickly.

Question: What would be your advice about setting an apple orchard and sweet cherries for fillers?

Answer: I would not advise that.

Question: Do you know any cure for the spot on the Jonathan?

Answer: It is a great problem—you will find the apple looking fine on the outside but it has a dark spot or spots on the inside. It is a very ticklish apple to deal with. I think the Bordeaux helps along that line.

Question: What about the Ontario?

Answer: I would not plant that apple.

Question: How are apples keeping generally this year in cold storage?

Answer: We shipped all of our stuff in refrigerator cars. The ones not shipped that way will not keep well. Apples need more spraying. There were a lot of scabby and wormy apples this year.

Question: What about the Delicious?

Answer: They are better Southern apple.

MARKETING AND DISTRIBUTION.

F. L. GRANGER, BENTON HARBOR.

If I am to do justice to my subject here, I should resolve this assembly into the study of the text on the back of the program. Solomon said "Comfort me with apples for I am sick of love." Mr. Kelder, who wrote this article goes on to say that the greatest manifestation of man's weakness for the apple since that demonstration in the Garden of Eden is evidenced in the development of the apple industry in North America. This continent, and particularly the United States is the greatest apple producing country, by far than any other in the world.

This proposition of merchandising is an extensive one, and the fellow who has imagination and commercializes it jumps ahead of his competi-

tor. I want to thank Mr. Kelder for bringing this to our attention the way he has.

Organization, standardization, advertise and merchandise. If I do anything or say anything, it is bound to be surrounding these four heads.

No merchandise campaign of any size or any efficiency can be put over without advertising, the consumer should be educated to the necessity for the use of this product. In my opinion we are a long way from getting value from advertising in Michigan. Of course, when you haven't got the goods to back up your publicity, your advertising falls to the ground. In order to advertise Michigan apples we, must standardize. We have no fair standard in Michigan.

If you will look at your Bureau of Markets report for 1921 you will find 4,894 carloads of apples shipped out the state this year.

There is the fact that we have 17 or 18 packing houses and every association manager has a different idea of what a standard A. Grade apple is.

If a man got a barrel from one house and another from the other later, he would not be satisfied with one or the other.

In the Northwest they tell the people what they should buy to be satisfied with his product. If a man wants eating apples in October and November, they tell him to buy Jonathan. If he wants apples in January, February or March, they recommend Winesap. They get him started on Jonathans and hold his trade throughout the season.

One place we fall down is that our varieties are not such as will carry a customer through until the marketing period is over. We have specialized in Baldwins and Spies and those varieties are winter keeping stock. As a matter of fact, I sat at my desk in Benton Harbor this year and tried to sell Indiana, Illinois, Iowa Baldwin apples. In September and October they told me that "we don't want Michigan stuff now, these Jonathans coming in from the Northwest are beautiful." The Jonathans are moving, the Baldwins are not moving.

One fellow in Fort Wayne, whom I have been after several times said this: "Why in hell do I want Michigan apples when I can buy Jonathans?" The advertising from the Northwest has been effective. There is a great demand and they are supplying that demand. People are satisfied and they are gradually taking our market.

We have been content to sell our fruit to Mr. Smith and some of the other people in Chicago who store it and we have not made any attempt to tell the people what we have. I do believe we have done well this year, but the effect to that campaign in the Northwest is going to be felt soon. I do not believe our organizations are in condition at the present time to advertise and advertise effectively. There are other things we can do just now that would be more effective with less money.

It all goes back to the standardizing of our fruit. The best way would be to have a rigid grading law. We can not get the rigid grading law from the statutes.

We do not have so much to fear from New York and the East. It is in the Northwest and Southwest where we must meet the competition.

The consumer sets the standard. When he shows a preference for a product that is superior. When he shows that preference he has established your standard for you. Better standardize by supplying the consumer with what he wants when he wants it.

If we can bring our organization up to 50% we have some control of the situation and we can go ahead and advertise and standardize. As it is there is but 20% with 80% offsetting it. You can't expect to sweep off the ocean with a broom.

Either we must organize so we control 50% of our produce or this distribution game is going into the hands of a man with large finances. This merchandizing proposition has gotten beyond the horse-trading stage. The time when we could put anything on the buyer and get away with it is past. Now we must follow our product to the consumer and satisfy him.

I am going to suggest something that I do not know will be agreed with. If we are to put money that the other fellows are putting in advertising into the cold storage plants in Michigan we will do more than that other fellow who puts it into advertising.

If we are going to grow late keeping varieties, it is up to us to deliver that fruit to the buyer and assure him that it is going to keep until February or March.

We have been selling Chicago and other markets Baldwins and Spies and with the expectation that they would keep until February or March and they have had to repack them in December. Often the shrinkage is so heavy that sawdust has to be placed on the floor to enable the workmen to make conditions satisfactory. The men who buy that fruit have lost money and they should not. Buyers who take the fruit from our hands should profit by it.

Reducing the temperature to a point where the ripening process is stopped is going to do more than any other thing we can do just now.

That cold storage proposition is an organization, which requires some little capital. It is a proposition I think we can with justice ask our canner friends to share, as they are going to be benefited as well as the growers.

If we consider the loss that we have had over a period of five years on peaches, plums, pears and berries, we won't hesitate a moment, if we have to go to the bank, to erect those coolers. I believe in addition we need more cooperation between the canner and grower. The wrong conception of the canner has been prevalent in Michigan today. The grower thought the last dollar he could take out of the canner was good business and the canner thought that the last dollar he could take out of the grower was good business. Anything that hurts the canner, hurts the grower, because the canning industry is thrown flat on its back from loss which they sustained. They ought to get together on a fair basis before hand. The canner, as a matter of fact, is a marketing agent of the growers, and should be protected. They should get together and have it definitely understood what they are going to do.

There is a canning concern in St. Louis with the following slogan: "We cannot succeed unless you prosper." The whole situation calls for greater organization and growers' cooperation. Some pooh-pooh the idea of organization. They think organization will fail. There is no question but what organization has advanced the fruit agency more than all others.

The fact that Wall Street has its eye on the growing farming interests is something to consider. When those fellows wake up and are interested in what is going on, you can make up your mind it means something.

Mr. Granger then read from a Wall Street publication.

"When Wall Street thinks it worth while to cater to the cooperative organizations."

I think for one that organization will really solve most of the problems we have.

Following Mr. Granger's talk the resolutions committee presented the following resolutions:

RESOLVED that a hearty vote of thanks be given the newspapers of our State for the generous publicity they have given our activities, especially this meeting.

RESOLVED: that we congratulate the Grand Rapids Press on the ownership of such a fine building and splendid assembly hall and give them a united vote of thanks for their generous hospitality in providing us such commodious quarters to hold this meeting.

RESOLVED: That we stand firmly on the proposition that no legitimate distributors of food products be debarred from handling canned goods or produce and that a copy of this resolution be sent to the Attorney General of the United States.

RESOLVED: Realizing that any tariff on fertilizer is a tax on agriculture, that we earnestly protest against any duty being placed on the importation of fertilizers and a copy of this resolution be sent to all Michigan Senators and Representatives.

WHEREAS the purchasing department of the Michigan State Farm Bureau and the Michigan Potato Growers' Exchange have made arrangements to buy spray materials and fertilizers jointly, we recommend that the fruit growers avail themselves of this opportunity to buy such supplies as they may need through these Agencies cooperatively.

BE IT RESOLVED by the Michigan State Horticultural Society in convention assembled that in the manufacture of any kind of food products, the term fruit or any of the varieties of fruit names, shall not be used in connection therewith unless such food products are made or flavored entirely from fruit and not in any part from synthetic or other artificial substances.

BE IT FURTHER RESOLVED that a copy of this resolution be submitted to the Michigan State Farm Bureau and their cooperation asked in pushing this proposition to a successful conclusion.

All resolutions carried with the exception of No. 4.

"Realizing that any tariff on fertilizer is a tax on agriculture RE SOLVED that we earnestly protest against any duty being placed on the importation of fertilizers and a copy of this resolution be sent to all Michigan Senators and Representatives."

Before voting on this resolution, it was thoroughly explained and Mr. Dow gave a talk about fostering the New American Industry of making fertilizer—potash especially. He made the statement that within a few years potash can be made here cheaper than in Germany or any other place. After quite a bit of discussion the resolution was voted upon and lost.

It was then proposed that Mr. Smith be given a rising vote of thanks for the flowers he has presented on this occasion. Same was done.

A report of the Horticultural Committee was then called for, which was as follows:

Meeting called to order by Chairman Buskirk. The committee recommends that a single list of commercial apples recommended for the State of Michigan be made, indicating the sections where the variety is recommended. This motion was seconded and carried. After the discussion, Marshall moved that the committee recommend the following varieties to the Society for commercial planting in Michigan: Wealthy, Jonathan, Grimes (double worked), McIntosh, Snow (Farneuse), R. I. Greening, Steele's Red, Duchess for Southern Michigan, Spy for Southern and Central Michigan, Wagner for Northern Michigan and Hyslop Crab.

Also recommended that the Elberta be the only peach recommended for commercial purposes for Michigan.

The list of pears recommended to the Society as follows: Bartlett, Kieffer, Seckle, Clapp for Southern Michigan, Howell for Southwestern Michigan.

The committee recommends that for efficient management, some system of intercropping be followed in raising a young orchard.

It was deemed advisable and recommended that the Society favor the establishment of a quarantine on the importation of raspberry plants into the State.

It was moved and supported that the Boss pear be included in the recommendations. Motion carried, and the recommendations adopted. The recommendation of a quarantine to be put on all Raspberry plants was then taken up. Professor Halligan explained this recommendation, saying that he did not believe there was a healthy raspberry patch in the State of Michigan and that diseases were becoming more serious every year, and that the quarantine would help to eliminate Blue Stem and other diseases.

This recommendation was adopted.

GROWING DEWBERRIES.

MR. WM. DALEY, RIVERSIDE, MICH.

This particular business is in a very immature state. We have not gotten to the bulletin stage yet. There is considerable work being started in this line and within a few years we will have a place along with the other bulletins on the shelf. The best we can do at the present time is to give you what we have.

We have been getting different results in different ways. As a whole the dew berry has given us excellent results. The average yield is 100 crates per acre. It is the largest of the blackberry family. We obtained the best results by putting on a heavy coat of manure and plowing before setting the field. The plants are set in rows about seven feet apart and the plants are crowded together as close as 20 inches.

They have to be covered every winter. The row builds up like a dike and you have a ridge to contend with. The best results have been obtained by the farmer, who removes this cover soil in the spring.

The black scurf thrives best in an alkaline soil. The farmers that have gotten the good results are those whose soil is acid. As yet we don't know just when is the best time to spray, but we are going to find out.

The plants are tied up to wires. It requires a post about 4 ft. in length. It has to be put only a foot or so in the ground, and a certain grade of twine is used.

Growing dew berries between apple trees is very profitable. We have vines that are twenty or more years old that are still doing very well, but of course disease troubles increase as they grow older.

One man has made a very good guess at spraying. He noticed that where he sprayed his apples, using Bordeaux and the Bordeaux falling on the berries, had given much better results than lime sulphur. His yields the past two seasons have produced a larger amount to the acre. His fields have been affected with this black scurf, but by applications of Bordeaux, he has experienced a control over the scurf.

Anthracnose has to be contended with. The only solution to that is to keep on a coat of Bordeaux at all times. We are going to get out a bulletin some day telling how many sprays to make and when to make them.

Mr. Daley then asked if there were any questions anyone would like to ask.

Question: Could the vines be mulched with straw as well as dirt?
Answer: They could be but it is more expensive.
Question: Is there any choice of variety?
Answer: Only one commercial variety, the Lucretia.
Question: How often do you cultivate?
Answer: Just about the same as any other crop.
Question: Where do you get the plants?
Answer: From almost any nursery.
Question: How do they propagate the plants?
Answer: Mostly from tips. They tip themselves if it is wet. They will grow in three months from the tips.

IRRIGATION OF SMALL FRUITS.

ARTHUR L. WATSON OF GRAND RAPIDS.

Irrigation in Michigan is just in its infancy. There is a great possibility in its future. You probably all know that there are several systems of irrigation, the ditch system, the overhead system, a system where the water is forced through tile. Skinner's overhead system is the most widely used in Michigan. This consists of overhead pipes drilled about every three feet and a patent nozzle in each. It seems to me that there is a great possibility in irrigation in the orchard. You spend money every year for mulching, cultivating and fertilizing and then sometimes the weather man does not send you rain until too late.

In the young orchard I honestly believe the person with irrigation can raise an inter crop. You can get enough out of this inter crop to more than pay for your irrigation.

Mr. Watson cited many instances where irrigation had proven very valuable. One was as follows: I had one-quarter of an acre put into tomatoes, the plants were very poor, scrawny and withering. But I had 207 bushels of tomatoes from quarter acre, due to irrigation for I could not have even saved the plants otherwise.

I believe one makes 100 to 300 per cent more on irrigated crops. The vines are healthier and the foliage is better. In growing everbearing

strawberries you are taking a chance on them without irrigation. Irrigation alone does not do everything—you follow up with cultivation. One can raise 100 per cent more berries by removing mulch and cultivating. Also in the orchard you will find that if you keep your orchards irrigated—the same moisture the whole season your crop will be larger.

I would like to see someone try the irrigation out on a bearing orchard and give us some information on that, as there is a great possibility in that line.

Question: What does it cost per acre to install this irrigation system?
Answer: From $250 to $400 per acre?
Question: What variety of everbearing do you grow?
Answer: Prolific, mostly.

DECEMBER 8, 1921.

AFTERNOON SESSION.

CONTROL MEASURES OF THE APPLE LEAF ROLLER, GRAPE BERRY MOTH AND OTHER INSECTS.

PROF. R. H. PETTIT, M.A.C.

The season just finished has given us opportunity to test out control measures against quite a few capital fruit pests and fortunately progress has been made in our knowledge of control in all cases.

The season is marked by the worst loss from grape pests in the memory of the writer and first of all as the author of actual damage stands the three banded leaf-hopper, *Typhlocyba tricincta*. This is a tiny little creature of very active habit, which passes the winter under rubbish and in the shelter of fence corners, fallen leaves, tall weeds and wherever useless material collects and supplies protection from the weather. There is no doubt in the mind of the writer that the destruction by fire of such harboring places during the late fall will finally prove the most effective and perhaps the least expensive means of control for this creature. I know that the job looks to be too big for human accomplishment but a very great deal can be done when we are driven to it. Of course, it must be done by groups of growers. It had best be done by communities, each individual doing his bit for the general good. The writer is fortified in taking this view by the memory of a similar outbreak in the Minnetonka grape belt of Minnesota and the ultimate success attained as a result of his efforts in finally getting surrounding areas cleaned up.

After the weather begins to moderate and the insects start to stir about they feed on almost any green plant but especially love raspberries, strawberries and similar plants. Toward the latter end of May they migrate to the vineyard where they soon mate and commence depositing eggs. During June the young, wingless hoppers become plentiful and by the middle of July, in a normal season, the eggs will have practically all hatched. Just as soon as the eggs have hatched and before the nymphs acquire wings the spray must be applied if the greatest efficiency is to be reached.

During the summer of 1921, samples of grape leaves were sent to the writer, daily, by Mr. Eckard, County Agent of Van Buren county, and an attempt was made to put on the first spray at the moment it when

would do the greatest damage to the hoppers. In 1921 this time occurred several weeks earlier than usual, in fact from June 20th on. The spray recommended was Bordeaux mixture and black leaf 40, using the latter at the rate of one pint to a hundred gallons of regular standard Bordeaux mixture. This seemed, when put on by hand, to dispose of all the young hoppers present. In order to be effective the spray must be made to hit the under surfaces of the leaves where the hoppers are usually at rest and a mere sprinkling done by set nozzles with a rig drawn rapidly through the vineyard did not prove very effective. Perhaps no other enemies of the grape require such careful and thorough work as the leaf hopper. Furthermore, it is desirable to delay this spray until the last possible moment before the young hoppers acquire their wings in order to allow as many eggs to hatch as possible, since the spray does not destroy the eggs, buried as they are, in the tissue of the leaf and protected by the fuzzy coating of the under surface.

As it normally happens that many eggs remain unhatched at the time of this spray, it will be necessary to repeat the dose again when these eggs have hatched,—and also when the second generation appears later in the season, it may be necessary to apply one other spray, although thorough work in the control of the first generation is usually sufficient for the season.

In conclusion: let me urge that the first spray applied for the recently hatched nymphs be generously spread over the lower surfaces of each leaf and that some attempt be made to at least destroy their winter quarters after cold weather sets in and during the period when rubbish may be burned, even if to successfully burn requires the addition of a small amount of oil.

GRAPE-BERRY MOTH.

In the same vineyards where the grape leaf-hopper was so very troublesome another pest was making trouble, namely, the grape-berry moth. This latter pest has for several years been the subject of increasingly insistent complaints and in response to this demand special effort was made to determine the most effective method of control, or at least to so time the customary sprays as to obtain the highest efficiency. Both of these projects were carried on in cooperation with a number of people, the growers entering into the demonstration with much interest, a number offering their vineyards for experiments and even furnishing apparatus and labor to try out the tests contemplated, also Mr. T. A. Farrand of the Department of Horticulture, Mr. W. C. Eckhard, County Agent of Van Buren county, and Mr. R. M. Hain, Extension Specialist of the Department of Entomology, who served as the mouthpiece for this department and spent his entire time in the region for several weeks giving advice and personally keeping in touch with the growers.

The grape-berry moth goes through the winter in cocoons enclosed in little flaps cut in the leaves. A semi-circular cut is made in the leaf and the little flap thus made turned back on itself, so as to furnish a cavity in which the cocoon is spun. The leaves fall to the ground and when covered with snow the cocoons are pretty well protected. The early destruction of these fallen leaves would, of course, result in lessening the number of cocoons and pupae the following spring and undoubtedly the clean culture recommended for the grape leaf hopper if carried out would lessen the numbers of grape-berry moth very materially.

However, the leaves would have to be collected early in the season since when the leaves dry up, the little flaps fall out and sift down to the ground readily when the leaves are stirred.

In the Spring, just previous to the time of bloom, the moths emerge and continue to emerge for about three weeks. The eggs are laid about four days after emergence and hatch in from four to six days. The larvae feed about twenty-three days, on the average, after which each one cuts one of the little flaps just described and spins up therein, in order to pupate.

There is a second brood, the adult moths of which appear about two weeks after pupation begins and the process is repeated so that the full grown larvae of the second generation just get nicely enclosed in the leaf flaps before the leaves fall. Now, the damage is done by the larvae which feed on the buds, blossoms and sets during the first generation and in the larger grapes during the second generation. The first generation binds some of the buds and blossoms together with a web and simply devours the little sets in enormous numbers. Since the fruit is so small at this time, very many grapes are destroyed outright in order to furnish sufficient food for the voracious larvae. The work at this time is not so conspicuous as one would expect but the damage is very serious owing to the enormous numbers of small fruit utterly destroyed. These larvae are dark greenish or purplish or tinged with wine-color. The second generation of moths appears after the grape-berries have attained some size and the larvae prefer at this time to burrow inside of the grape-berries, often tying several of the berries together and, of course, ruining the fruit and spoiling the appearance of the cluster.

Now, success in controlling the grape-berry moth depends more than anything else on getting the first spray on just at the proper time. If put on too early the rapid growth of the plants spreads the particles of poison so that the larvae may entirely miss getting any and escape. If put on too late the larvae will be inside of their little webs and many will not be touched at all. The exact time to apply the spray would naturally be just before the first webs are formed,—the best that we can do is to apply the spray immediately after the very first webs appear, that is after the first of the fruit buds and blossoms show the tiny webs. The growers should be ready for this spray and be prepared to apply it instantly on the first appearance of webbing. At this time he should use Bordeaux and arsenate of lead, using one and one-half pounds of dry powdered arsenate of lead to a barrel of bordeaux, and some growers even prefer to mix in a little Paris green in order to make the spray act more quickly. The time for spraying usually occurs from three to five days after blooming nicely starts, but the true criterion would be, of course, when the very first webs appear, or when the webs have begun to form.

Another spray should be applied when the berries begin to touch in the cluster and when they are about the size of buck-shot. The reason for selecting this time is in order that the spray may be made to penetrate through the cluster and thus poison the interior of the cluster which will be impossible after the berries become closely packed due to their increase in size. Put this spray on while you can still get it to go in between the berries of each cluster, using the trailer method of application because with set nozzles one finds difficulty in hitting the clusters when using our system of trimming and pruning. As a final

word: it will be worth while to remember that while the first generation is usually of fewer numbers than the second, nevertheless the individuals that escape the first spray become the parents of the second generation.

PEAR PSYLLA.

The work on pear-psylla this year was carried on in cooperation with Mr. Dutton of the Department of Horticulture. We were able to make use of our insectary to good advantage in this project in the following way: During the late winter Mr. Dutton very kindly secured a quantity of hibernating psyllas in a birds' nest, taken from a pear orchard badly infested. These hibernating forms were brought in while still cold and we placed them in a cage in our insectary, together with a number of pear twigs. The psyllas promptly came out and in due time deposited large numbers of eggs on the twigs, making it possible to carry on tests of different spray solutions right in mid-winter. After testing a number of substances it was finally decided that lime-sulphur was most effective. After this the whole thing hinged on the exact time of application to get the optimum results. Mr. Dutton will discuss this matter at length and give you the results of field trials over which he exercised supervision.

THE FRUIT TREE LEAF ROLLER.

The fruit tree leaf roller has for a number of years been getting worse and worse in Michigan and at present it is spreading to new fields. An attempt was made this year to find an efficient spray, in hopes of killing the creature in the egg stage. An orchard of Mr. Oscar Braman, near Muir, happened to be badly infested and this was selected for the trials. A visit to the orchard, early in the season, resulted in bringing in many egg masses which were treated as were the eggs of the pear-psylla. Just before the time of hatching they were treated with various sprays, mixed of various strengths and then watched to determine the best material to use. Pratt's scalecide seemed to give us the best results when used strong enough, so this material was decided on for the spray. Mr. Braman then sprayed his orchard using one part of scalecide to twelve and a half of water, just before the time of hatching of the eggs. The spray was applied at the time when the buds burst and with very good success, the number of worms being reduced quite markedly over those found in previous years. These two instances illustrate the use to which an insectary can be put and the advantage obtained in determining the best method of procedure long before the regular time of application occurs.

CODDLING MOTH.

An attempt was made to set a time for the second generation of codling-moth as in previous years. Thirteen stations over the State were used for making observations and the time computed for all parts of the State, where apples are grown. We experienced difficulty in several cases because of delay or failure in getting reports from the observers. We hope next year to arrange to get these reports by wire in each case and on the day on which the insects emerge. Another difficulty was caused by people spraying too early, reasoning that it was good to get the spray on good and early. Of course, a spray put on early is inadequate to protect the fruit until picking time and as the season was such

an exceptional one anyway, and so very early in all ways, an additional spray was recommended, through the County Agents, to lessen the likelihood of late injury by the worms. In places this was carried out successfully and in general the dates set seem to be about right for at least most parts of the State.

APPLE SEED CHALCID.

The apple seed chalcis passes the winter inside the apple seed either on the ground or in the stored apples. Late in May the larvae change to pupae, and in June small, wasp-like creatures appear which fly about and lay the eggs for the next generation. The eggs are laid in the apple when the apple is from one-half to three-fifths of an inch in diameter. The female usually drives her ovipositor clear into the seed, making a discoloration in the fruit which may disappear as the fruit ripens. The blemish appears, in mature fruit, as a black dot, occupying a more or less distinct depression and giving the apple a knotty form. From each of these punctures a brownish line of hardened tissue extends to the core.

To control destroy all apples left in the orchard. The adults are good fliers.

TOPIC: CONTROL OF APPLE CANKERS.

DR. G. H. COONS, M.A.C.

The purpose, so far, has been hurriedly to put before you pictures illustrating the different types of attack that weather and parasites make on apple trees. Bacteria cause fire blight; a fungus causes black-rot canker; there is a canker caused by the effects of drying winds on frozen trees; also a northern canker of fungus nature that comes on impoverished trees.

Although since 1915 we have been fighting fire-blight, it is still with us. The control measure to use in the winter time is removal of hold-over cankers and in the summer time, the removal of blighted twigs. Then, as said before, we have this black-rot canker everywhere in every orchard and it is impossible to do away with it. The cankered limb ekes out an existence for about five years before it is girdled completely. The last two or three years the limbs are almost worthless because they produce fruit of poor quality. To fight this canker, one needs careful work in pruning. Sound limbs with smooth bark are the only ones that should be left, even though they are smaller than their cankered brothers. Better a small clean limb than a large moribund branch. It is remarkable how such elimination of unfit limbs will clean up an orchard and make black-rot of little importance. To the same extent, it is remarkable how neglect will injure an orchard.

With reference to the northern canker. The only suggestion I can make is to heartily commend the program that is being undertaken now, under the supervision of Secretary Farrand, namely judicious tree feeding, giving a close consideration of the principles laid down by Professor Kraus. I wish to point out that, given feeding of the trees, the winter injury will be reduced. My reasons for this recommendation are that I have never seen this particular fungus canker do any damage on a tree that was making the proper growth. I have found this almost uni-

versal in orchards in certain northern sections of the state and in old as well as in young orchards. With little trees trying to fight barren sand I have seen them half ruined by this canker. Canker control, then, simmers down to (1) the elimination of fire blight both in the canker and the twig stage, where one has actively growing trees, (2) the selection of sound limbs to produce the scaffold branches of the tree, and (3) the judicious feeding of trees.

I cannot leave this platform without making a plea for proper care of the apple tree. Sometime ago I stood under a tree that produced 65 bushels of apples. The tree was cankered and limbs had been taken off. The owner said that he sprayed it occasionally as it was near the house. That story could be repeated with perhaps not so great a yield for every old apple orchard in the state. It must be said that principles of pruning are not followed and as a result orchards are full of woodpecker holes. Stubs have been left and have not been covered. It will take about three years for the natural processes to cover a pruning wound. In the meantime, it is necessary to take pains to keep rot fungi out and this is best done by keeping these holes covered with some good impervious coat. For this suppose we consider best a coat of pure white lead. Put this on and renew it, so as to keep a protective coat over the wound until natural healing can take place. If you do not do this, orchards that have been planted by someone in faith, orchards that have been taken care of for years, orchards that have fulfilled every promise, are going to be snuffed out in a scant forty years and those inspiring old trees that we see here and there are not going to be on your place and they are not going to be left in the state for us to point to with pride. A good many of these orchards you have fallen heir to, someone else is responsible for the rotted heart wood and the weak branches. But everyone has an orchard of young trees, or will have one coming on, sometime. Let us highly resolve to prune this correctly and conserve the heart wood from decay. For in so doing we shall add length of life to our orchards.

Question: Is there any such a disease as "bitter-rot"?

Answer: Yes, but it never does the damage with us because of our climate. Bitter-rot is common in Virginia and southern apple districts. We do have a "bitter-pit" which is not caused by any attack of organisms upon the apple. It is probably due to unevenness of water supply during the growing season so that certain cells die. About all the fruit growers can do is to try to prevent the breakdown which follows uneven water supply by rushing the apples into cold storage and to see that in the storage, aeration is sufficient. By use of this method it has been possible for growers in Australia, where bitter-pit is common, to ship their fruit to England, some four-weeks-trip, simply by cold storage. In keeping water supply uniform by irrigation the amount of bitter-pit was cut down markedly in experiments in western Washington. This disease is most serious on Baldwins, but it comes on other apples.

Question: Would fertilizing help any?

Answer: Cannot say definitely. If you are to follow the principles Prof. Kraus laid down, yes. These suggestions lead to balancing of vegetative and reproductive phases of tree growth, unevenness of bearing, and evenness of fruit distribution.

Question: Could you cut blight canker out and save the limbs.

Answer: Yes, a knife or carpenter's gouge, and this cleaned portion

should be treated with a disinfecting solution such as formaldehyde 1–10, then when the wound is dry, paint with white lead.

Question: Do you think orchards in sod would be more likely to have it?

Answer: Yes, because of the drain on the soil moisture by the sod.

Question: Is it in large apples more?

Answer: Yes, but I have seen it on small apples also. It is more a tree and branch problem than one limited to the size of the fruit. The trees with apples poorly spaced suffer most from bitter pit, and in such trees the large apples are produced. It is not alone dryness that causes it, but unevenness of water supply in that a certain amount of flesh is produced more than the water supply provides for. I do not know of a year when I have not seen some bitter-pit.

Question: Isn't very little experimental work being done along this line?

Answer: Experimental work in this country is being handled by the U. S. Department of Agriculture. Their experiments are carried on in the West. A very extensive experimental project was carried on in Australia. The generalness of the disease and the lack of specific cause, makes control work aside from general recommendations, difficult.

Question: How about canker on King apple trees?

Answer: King is subject to black-rot and subject to fire-blight. I think from the description you have just given your trouble is black-rot. If the canker is such that the bark scales off, exposing the wood, it without doubt is black-rot and the things you describe are the preliminary signs before the limb dies.

SECRETARY'S REPORT, JANUARY 1, 1921 TO DECEMBER 1, 1922.

Total Receipts	$2195.16
Total Disbursements	342.78
Amount on hand December 1, 1922	1852.38

Report adopted.

Meeting adjourned.

REPORT OF MID WINTER MEETING

Michigan Agricultural College, East Lansing, February 1, 2, 3, 1921.

Meeting was called to order at 9:00 A. M. by the Chairman, Mr. G. A. Hawley.

Chairman: It is rarely that a man who grows up in an Institution of this kind becomes its President. I do not need to say a word to you in order to introduce the speaker. He is known by people from all parts of the State. It gives me much pleasure to introduce to you President Kedzie of this College.

ADDRESS OF WELCOME PRES. F. S. KEDZIE.

President Kedzie: Friends you are welcome to this Campus. This is the first meeting of the State Horticultural Society here at this College and I want to say that it gives us here unusual pleasure. It is something that we have looked forward to for a long time, have wished for and now it has come. Very few people understand that this Institution was the outlook of Associations together as Agricultural and Horticultural work. This Institution while it was mentioned in the first Constitution and provided for in Michigan's first Constitution was recommended to the Legislature for appropriate action by the Michigan State Horticultural Society and my earliest recollection of the interest of this Society in this College was a Sheep Breeders' Meeting which was held in the 60's conducted by the Michigan State Horticultural Society on the Campus. My earliest recollection of this Association represented here is that of a meeting held in a little hall over a Grocery store in the City of Lansing. The man who was instrumental in developing that work was a man by the name of J. Tompkins and the work which is bearing fruit today in this organization was begun by a number of the most energetic, enthusiastic men that Michigan has ever had. Nobody has ever worried about the State Horticultural Society becoming ineffective. We welcome you here to this room because this building represents many of our Agricultural efforts and in this room a number of very interesting and very important meetings have been held, are held from day to day. Here is where the Michigan Potato Growers' Association had, you might call a scrap, which was one of the most beneficial meetings that was ever held in Michigan.

So far as Organization is concerned here is where the Milk Producers' Association meets and discusses vital problems. I hope that in the meetings which follow this meeting of your organization you will feel that at this place, of all places in the State, it is where you should during each year hold, at least, one of your meetings. I have not talked this over with Professor Halligan or any of the rest of the men who have been associated with you so intimately but, I, on behalf of the Institution am welcoming you here. I wish to express to you the feelings which I

have and always have had that this place, the College, is a particularly good place for the State Horticultural Society to meet at least once annually. You are most welcomed and you have everything at your hands that we can furnish. Thank you.

(Applause)

Chairman, (Mr. G. A. Hawley) Mr. President, Ladies and Gentlemen, it is certainly pleasant to us to be welcomed to this Institution where so much of the Horticultural science has been developed. We should feel at home here after this welcome. It always counts. As has been said this is the first meeting that this Society has had at this College and it has been organized for fifty years. It may seem strange to us that this is a fact but Mr. President, I believe that there were attractions in other places that were of more importance than if we had met here with you. Your work is a scientific work. It has to do with the questions that we ask. Our work is in spraying and the use of practical men in the field and when all is said and done it is true, that the facts which are developed by you are worthless unless they are for the practical use.

This College has grown in the last thirty years. We hardly recognize it as it was at that time. Without casting any reflection on what it has been, I presume it would be quite in order if we should say something that really reflected on what it was thirty years ago. I want to tell you something, my impression possibly, of this school thirty years ago. I came from a fruit growers section. We grow some fruit there. We hardly expected to find the best practices here. We used to pick our fruit on the nice days when we could see its color. We had the up-to-date packing method and we supposed we were fairly advanced in the handling of fruit. I want to tell you that during my days at this College I never knew of them to harvest fruit except apples. The picking baskets were the crudest kind built in which the fruit was placed. That is my recollection. The kind of fruit harvesting that was done at this College at that time was not much good. However, that may be, today we know that here is where we have come with all of our questions to be solved and they are solved and properly discussed. But we must think from time to time, and in fact we are forced to consider what importance is there to this horticultural Society. It has been inferred plenty of times that we were filling no place in particular. If we are not, we are useless and the quicker we are scrapped the better. We have no place for things that are useless but here is what I conceive the Horticultural Society is now. Knowledge is developed in an Institution like this but this knowledge must be passed along to the growers, the men in the field, the man that is raising the family and establishing the best citizenship of the State.

The time was and it still exists in a great degree, when a teacher could not approach a practical farmer. He can't today. If we wish to know how to do a certain thing on the farm the first thing we do is to go to a successful farmer. We go to a successful fruit grower and learn the thumb rules of successful fruit growing.

Your Horticultural Society meets three times a year which is plenty. Every meeting is profitable. You come together three hundred strong. You come from every portion of the State. You come here to improve yourselves in the methods of raising fruit for the particular reason of making money and building homes and doing this job in the best possible

manner. What is your further effect on the people of the State? You are just a few. You place one good fruit grower in the township in every fruit growing township in this State and within ten years nearly every man that is raising fruit is copying that fruit grower. The knowledge from this College goes to you men who go to meetings of this kind. It is carried to all portions of the State, spread out to all, and it is this business which is the function of the Horticultural Society.

I said while we are meeting at this place we should consider our particular place in the spreading of Horticultural knowledge and the use of the Horticultural Society which depends upon the individual effort of each member as he goes home and tends to his own business in a selfish manner. There is another thing that sometimes we think of, it is brought to our attention at all times and that is, is this Horticultural College science as important as in other States. You represent the greatest proportion of the fruit growers from all over the State. Our work in this society is the highest grade that they can possibly produce us. The organizations in the other States seem more effective but if we could stand away and look at Michigan's Horticultural Society we would come back home and tell that we had the best Institution in the world. They will tell you, you can do better, you should do better than you are today. I remember twenty years ago there were eight or ten in the meeting. It was a pretty good meeting for those days. You have heard and I have heard how fine the old days used to be. I was talking to a friend of mine one time and he was saying how much finer the days used to be. I asked him, "What did you get a day when you were working?" "We got 40 cents." "What did you wear?" "High top boots and overalls." "They were the good old days." Why were they the good old days? He was young, full of vigor, that was the reason they were the good old days. We will not try to compare the things of today with the things of those days until we take the same standpoint, when you view them. (Applause)

Chairman: I am pleased to introduce to you Dr. Shaw of the Agricultural Department.

Dr. Shaw: The text of the sermon as you might call it was presented by the presiding officer when he stated to you that the Horticulturists of the State come to this Institution with problems that need solution. I would like to talk just a few minutes about the setting so far as the investigations of the Agriculturist is concerned to meet the demands that are made upon the Institution. The Horticultural interest of the State of Michigan is very complex. Indeed, we are sometimes inclined to make a classification of the industries of Michigan and divide them in five groups. Some of you may have heard this classification before so please be patient about it. We have a great manufacturing industry, a great mining industry, a great marine industry, a great lumbering industry and a great agricultural industry. That makes five. Because of the present condition in the State we are justified in dividing the Agricultural industry in two Courses, Horticulture and Agriculture. That makes six grand divisions. You recall that some of the States with which we are sometimes compared do not have all six of these industries upon which their men have to be divided and their energy and thoughts and activities. Many of them have but two, Agriculture and Horticulture. When the 1910 Federal census was taken the State of Michigan

was rated about third in the production of orchard tree fruit and second among all states of this country in the production of small fruits. Because of our geographical location and environmental conditions we have an endless variety of products which may be found in the Horticultural classification. You have almost everything in the vegetable line, in the small fruit line, in the production of onions, celery, lettuce, peppermint, contract farm seeds and a great long list which I might enumerate; almost everything except citrous fruit and cotton would come within our list. You notice in Agriculture we produce the staple crops. We have the kind of live stock you usually find in a live stock state. The point I want to make is this, so far as scientific research for the purpose of given results in the case of the problems of the Agriculturist and Horticulturist in the State of Michigan we have a greater variety of needs and demands upon our research workers than is the case in any other State in the great continent. It has been a very difficult matter to meet all of the problems that have been placed before us. This has been particularly true during the last 60 years. During the period of the war about 40 young men working in the Agriculture Division and Experiment Station were engaged in some form of military service. The turnover in the Experiment Station of the United States during the war period amounted to 80%. In some cases replacement was made but in almost all instances it meant replacement without experience. It meant this, it was a very difficult matter to meet all of the questions that were brought to us and an impossibility to solve all of these.

I want to call attention just briefly to some things relating to the facilities and policies so far as the Experiment Station is concerned now. Please bear in mind first, that in all of this almost endless variety so far as production is concerned. We have first, a greater number of demands than any other Institution in the Country. When I came to this Institution on the Agricultural side of the Campus were two departments; a Department of Horticulture and a Department of practical Agriculture with a Professorship in each case and not a very large group of assistants. Since that time the Agricultural Division has been organized and developed to a point where we now have 11 Departments: the Department of Horticulture, Forestry, Soils, Crop Management, Farm Courses, Poultry, Agriculture, Educational Farm Management, Animal and Dairy Husbandry. There has been a period of organization so far as the Agricultural Division is concerned throughout the past 18 or 20 years. The Organization was practically completed at the meeting of the State Board of Agriculture when a Department of Farm Management was created and a staff appointed. It has been the policy throughout these years to try and build these Departments up uniformly and systematically.

I would like you while here to bear this in mind and look all of these Departments over and see whether this Institution has succeeded in the Development of these various Departments in a uniform and systematical way in accordance with the demands which they have to meet. While you are interested in things pertaining to Horticulture, we wish you to see all of the Departments we have in the Agricultural Division. We want you to see our horse barns. One of the Western Horsemen made a remark here two years ago that we had in our horse barns here the best lot of heavy draft horses of any Institution in the United States.

We want you to see those during your spare moments. The Editor of Hoard's Dairyman was here at the same time. He went through all of the barns including the piggery, sheep barns, beef cattle, dairy cattle and horses and upon his return to this Building he made the statement to me that the Michigan Agricultural College had the best balanced live stock equipment of any Institution in this Country. The thing that we are in great need of is more modest publicity so that the people of the State may know just what they have in the Institution. Despite the fact that the Horticultural Department was one of the first established and equipped at this Institution in the maintenance of uniformity in development it is my opinion that so far as teaching and development is concerned the Horticultural Department of this Institution is in line for assistance by way of buildings and facilities for carrying on investigational work. We hope the State may be able to furnish in the not far distant future funds which will enable this Institution to extend the Building equipment and the facilities and the men with which to carry on the investigations and solve some of these problems with which we are confronted.

(Applause)

Chairman: Our next speaker will be Mr. George Comlossy, Superintendent of Perishable Protective Service of the New York Central Lines, of Toledo, Ohio.

Loss and damage to perishable freight in transit may to a large extent be overcome by proper preparation of the shipment, proper stowing of the containers in the car and by the use of good judgment in preparing the car to withstand weather conditions prevailing in transit.

It is essential that the shipper have full knowledge of his commodity, his containers, the car and protective service necessary to afford the shipment safe conduct to destination.

I will first treat of the preparation of a refrigerator car to withstand normal winter weather. An ordinary refrigerator car has three classes of natural openings which must be protected by the shipper.

1. The hatchways or openings thru the roof at each end of the car. There are four hatchway openings, the fundamental purpose of which is to admit ice to fill bunkers when car is under refrigeration; these openings are equipped with canvas rimmed, insulated, removable plugs and hinged hatch covers. Cars moving into temperatures below freezing must have the plugs in place and hatch covers closed. To further assist in preventing the entrance of cold air or exit of warm air, I recommend that shippers lay two thicknesses of building paper on top of the closed plugs, completely covering hatchway opening, and close hatch cover over paper. This will require a total of 24 running feet of building paper.

2. The next important natural openings are the drain pipes, four in number, one thru the floor at each corner of the car. The purpose of these drain pipes is to carry off melted ice water when car is under refrigeration. Some drain pipes are equipped with a catch basin or bell trap at the top of the pipe and others have a drip pan or can over the end of the pipe. Where these traps or cans contain water or ice, they are effectively closed and will not admit outside air to the car. I recommend that the shippers see to it that the drain pipes are effectively closed, the most effective method of closing same being to wrap the equivalent

of two thicknesses of building paper around the end of the drain pipe firmly tying paper to the drain pipe.

3. The third natural openings are the side doors thru which the cars are loaded. These doors are usually on hinges and when closed ordinarily effectively shut off transmission of cold and warm air; but most cars are constructed with a steel or iron threshold to protect the bottom sill of the doorway against the continuous wear given this portion of the car during the process of loading and unloading. Steel and iron are conductors of cold and heat. I, therefore, suggest that shippers place two thicknesses of heavy building paper across the bottom third of the closed doors when loading is completed, carefully sealing the edges with lath, allowing them to lap down over the threshold plate. The principal idea is to protect the iron threshold or crevice at the bottom of the doors against direct contact with the cold or cold winds. This should be done to both doors.

If the three classes of natural openings are protected in this manner, it is unnecessary and, therefore, waste of good materials to paper the walls of the ice bunkers or bunker bulkheads in the ends of the car.

Durable construction of refrigerator cars is essential; large solid wood sills form the frame to which the floor sides and the ends of the car are fastened. To date no refrigerator car builders have devised a method of completely insulating the sills of the car; therefore, the coldest part of the car is to be found in the lower corners thereof, at the junction of the side walls and the floor. False floors, which elevate the commodity from four to six inches above the floor of the car, are being constructed for refrigerator cars as rapidly as same are built or pass thru the Shops for repair; these false floors, in a measure, overcome freezing of the commodity adjacent to the floor corners but when cars are passing into temperatures below 20° above Zero I recommend that shippers unroll two thicknesses of building paper the full length of the car and fasten the upper edge of the paper upon the side wall of the car a distance equal to one-half of the width of the building paper, allowing the lower half of the paper to extend out on the floor of the car. This will assist in protecting the commodity against the cold corners.

Added protection can be afforded by covering the balance of the floor with one thickness of building paper, overlapping the edges one to two inches and tacking a curtain of one width and thickness of building paper on the side walls of the car so that the lower edge of same overlaps the two thicknesses below it about 6 inches. It is unnecessary to paper the side walls of the car higher than three feet from the floor. If you are going to place heaters in the ends of the car, or are going to have the car placed under heater protection West of Chicago, do not paper up the ends or bunker bulkheads of the car. If the temperature outside is below 40° at time of loading I recommend that shippers place a suitable stove in the car and elevate the temperature inside the car to 40° above zero during the process of loading.

Sacked potatoes should be loaded in a definite manner. A satisfactory system may be arranged by placing six sacks snugly side by side crosswise of the car, a distance of about one-half the width of a sack away from the bunker bulkheads or end of the car; on top of them place six more sacks with one end against bunker bulkheads or end of the car; then, place three sacks crosswise of car on floor in front of the first six;

then, three sacks crosswise of the car in the hollow between the first six sacks and the adjacent three; then place six sacks snugly together directly in line and above the first six sacks (these will be the distance of one-half the width of a sack away from the ends of the car); on top of these place six more sacks against the end of the car; then place three sacks crosswise of car against the first three sacks which were placed on the floor, and in the hollow where these two series of three sacks each meet place three more sacks crosswise of the car. From this point forward thru the load fill all hollows in like manner until you are within about four feet of the doorway. Then, place six sacks crosswise of car against the last floor series of three crosswise sacks and build up the face of the load with layers of sacks in each tier, six wide with one end tightly against preceding sacks which were loaded three wide crosswise of car. This should safely bulkhead the load in the ends of the car and set the floor tier sacks back from the doorsill at least six inches.

In severe cold weather to keep the corner sacks away from the cold corner of the car in the floor tier, leave out one bag from those loaded in series of six and turn one bag end to end of car of the sacks which were loaded in series of three. This permits of a space of about six inches between the side walls and the sacks on the floor tier.

If the weather is very cold, additional protection may be gained by building racks along the sides of the car, composed of two by fours about 2½ feet long, angling away from the side of the car a distance of one foot to one and one-half feet; and against these two by fours nail one by six boards, lengthwise of the car; and against these boards load the sacks in the manner above prescribed. These side racks will preserve an air space between the cold corner of the car and the sacks.

A stove can be secured in the doorway and arrangements made to facilitate exit for chimney and entrance for messenger. The messenger must travel with car when stove is burning and must ride in caboose when train is moving.

BUSHEL BASKET.

The bushel basket is a convenient and economical container but is not a safe container for the transportation of fruits and vegetables unless the following factors are given detailed consideration:

1. The baskets must be of strong and durable material, designed and constructed properly. Staves of a bushel basket must be at least 20 in number 2 3–16 inches wide and the thickness of a stave varies with the character of the wood, from 1-14 to 1-20 of an inch. Generally speaking, baskets should not be used in transportation whose staves are less than 1-18 of an inch in thickness and made of hard maple, beach, birch and woods of equal strength; though Gum, soft maple, soft elm and oak is satisfactory if cut 1-16 inch in thickness. Cottonwood is sometimes used but must not be less than 1-14 of an inch in thickness. The belly-band or center hoop should encompass the basket at a point equidistant from the top and bottom of same. The slope to the side of the basket from the top to the bottom should be as near perpendicular as possible and still permit of telescoping the empty basket for shipping purposes. The round raised cover has proven itself to be most satisfactory. Aim to secure baskets with as wide a bottom surface area as possible and always of one type of cover, preferably round. If the

basket is of good sound materials of proper thickness, well seasoned and properly constructed, the centerpost is unnecessary.

2. They must be stowed in the car in such manner and by the adaptation of the proper type of load to the varying widths of cars so that there is a minimum of slack space into which the baskets may shift or settle. It is also essential that the baskets be stowed uniformly thruout the load, each basket bearing equal resistance to the normal load thrust and sideway of the car on its springs while moving in transit or being switched in the yards. Care should be taken to see to it that no car is overloaded. Soft fruits should not be loaded more than three tiers high and no commodities requiring refrigeration and ventilation should be loaded over four tiers high, unless ice is packed in the baskets with the commodity.

TYPES OF LOADING.

a. End to End Offset—adapted to cars not wider than eight feet three inches, inside measurement.

b. Five-Five Offset—adapted to cars exceeding Eight feet three inches, inside width.

TERMS USED FOR DESCRIBING VARIOUS METHODS OF LOADING.

The term "Tier" is used to describe one layer of packages loaded parallel to the floor and is one package high. Example "Three tiers High."

The term "Row" is used to apply to a line of packages parallel with the length of a car and one package wide. Example "Five rows Wide."

The term "Stack" is used to apply to a pile of packages placed across the end of the car parallel with the end and is one package long. Example: "22 stacks long."

DESCRIPTION OF END TO END OFFSET LOAD.

Place the first basket snugly in a far corner of the car with the handles diagonally to the side of the car. Place the first row of baskets along the far side of the car with handle in same relative position. The number of baskets along the side of the car varying with the length of the car. If the number of baskets placed singly side by side just equals the distance along the side of the car—say, 22 baskets long—you will only place 21 baskets above these in the next tier, setting or offsetting each basket in the upper tiers on two baskets in the lower tiers. Build the first row to full height of the load before starting second row. The first tier in the second row will total one less basket than the first tier in the first row and the baskets in all succeeding rows will be offset or placed so that one basket fits in to the triangular space left by the two baskets to which it will be adjacent, and each succeeding row must be built to full height of load as loading progresses. After completion of the fourth row, finish the loading of the last two rows from both ends of the car towards the doorway, and if loading has been done properly and with care the baskets should come out evenly placed in the doorway.

Advantages of the End to End offset method:—

a. It gives an increased number of baskets for the same height of load over any method of loading baskets upright and offset.

b. It gives an evenly distributed load thrust to a maximum number of baskets and results in the load arriving at destination with baskets in the

doorway in an even and uniform position. The Inspector, or Receiver, gains therefrom a good first impression of the carload.

c. A load of baskets properly stowed by End to End method does not require gate bracing in doorway to take up lengthwise slack, thereby saving material and labor costs of installation of bracing gate.

DESCRIPTION OF FIVE FIVE OFFSET METHOD.

Place the first baskets snugly in one corner of the end of the car with the baskets' handles diagonal to the end of the car. Arrange 5 baskets along the ends of the car with handles in the same relative position. Start the next tier in this stack from the opposite side of the car, offsetting each basket in the upper tiers, placing each basket in the upper tiers on the two baskets of the lower tiers so that the weight of each upper tier basket is divided evenly between two baskets of the lower tiers. Build the first stacks in each end of the car to their full height before starting succeeding stacks. Build each succeeding stack by placing the end baskets snugly against one side of the car and the next against the opposite side. Load from both ends of car toward doorway, stowing tightly, using special car to push the baskets in the bottom tiers in each stack firmly back against the baskets in preceding stack, keeping the face of the stack vertical. The complete success of this type of load depends upon having all baskets snugly stowed as the loading progresses and have just sufficient room left in doorway to evenly and snugly place the last basket to be loaded. If there is a slack space of two or more inches in the doorway or baskets are unevenly and irregularly placed in doorway the contents of these doorway baskets will be damaged, load jumbled and give the buyer a bad "first impression" upon opening the car for inspection. If the space left in doorway when both ends of car have been loaded is slightly insufficient to permit inserting baskets with cover up uniformity of placement of baskets may be preserved and space properly filled by placing every other stack of baskets adjacent to and in doorway space with cover side down. An added precaution is to always tie covers on baskets which are turned with cover side down. In the event that a uniformly tight load cannot be secured by this method it will be necessary to brace baskets securely in ends of cars by use of Gate braces in doorway.

DESCRIPTION OF GATE BRACING.

When bracing a load of bushel baskets to take up lengthwise slack in the load, only clear, sound well seasoned, strong wood should be used. Material requirements for load three tiers high:

1. Crosspieces—6 pieces 1″x6″xWidth of car
2. Uprights—6 pieces 2″x4″x4″longer than height of the load.
   2 pieces 2″x4″x½″shorter than inside heighth of the car
3. Toenail cleats—6 pieces ½″x1″xwidth of car
4. Crossbraces—12 pieces 2″x4″ cut of equal length and this length 4″ less than the distance across slack space which is to be braced.

CONSTRUCTION.

1. Place one 1x6 crosspiece crosswise of car in front of and against each tier of baskets on both sides of space which is to be braced.

2. Car widths vary from 8 ft. to 8 ft. 6 inches; so when placing the 2x4 uprights against the face of the load and the 1x6 crosspieces, distribute them in a manner which will most evenly divide among them the weight or load thrust. For example, in an 8 ft. car the uprights at the ends of the gate would be nailed to the crosspieces at least one foot from the sides of the car and the 2 center uprights in the bracing gate would be 3 ft. from the sides of the car. One of the center uprights must be the ceiling upright which when nailed to the crosspiece keeps the bracing gate from riding up the face of the load.

3. Nail to the uprights crosswise of the car, parallel to the lower edge of each crosspiece, one 1″x½″ toenail cleat.

4. Place three 2x4 crossbraces lengthwise of the car between each pair of uprights and drive each crossbrace down to its toenail strips and toenail the crossbraces to the uprights. Repeat this operation until all four sets of crossbraces are in place.

Dependable bracing can be obtained only by the use of nails having trade weight of 10 pennyweight or more. Crossbraces must be toenailed with not less than three 12 penny nails to each upright at each union between upright and crosspiece.

BARRELS.

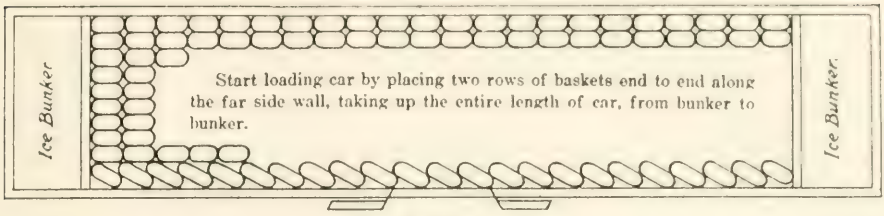
Unless the staves, hoops and plates are of sound clear material, properly set up and when filled with head plates thoroughly and properly nailed, no system of loading devised will prevent loss in transit due to opening of barrel heads. Let us assume that the barrels as they come from the cooper are good material, properly set up with a croze not less than 3-16″ deep.

Headliners are unnecessary, nor as cheap, in securing the heads as nails of sufficient number properly applied. To properly nail a head composed of three plate pieces, drive a 6d nail thru the top hoop and shell of the barrel at an angle of 45° into each corner of each plate piece so that 1-8″ of the nail shows at the junction of the head and staves. For good measure drive one nail or two at the most unsecured point or points. Ordinarily a properly nailed head requires between 8 and 10 nails.

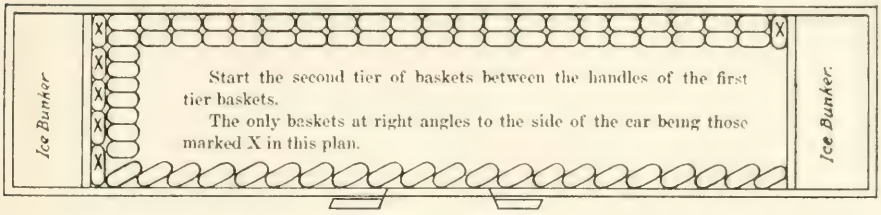
CROSSWISE OFFSET LOADING SYSTEM FOR STANDARD STAVE BARRELS.

The principle of this load is to have all barrels end to end crosswise of the car, on side, with bulges of the barrels in the upper tiers resting on the ends of four barrels in the lower tier. Barrels should never be loaded bulge on bulge. A complete diagram with full directions of proper barrel loading methods may be obtained upon request from Mr. Comlossy, Superintendent, Perishable Protective Service, N.Y.C. Lines, 408 Produce Exchange Bldg., Toledo, O. (in fact, any shipper having loading problems is invited by Mr. Comlossy to communicate with him).

END TO END OFFSET LOADING SYSTEM
FOR STANDARD CLIMAX BASKETS



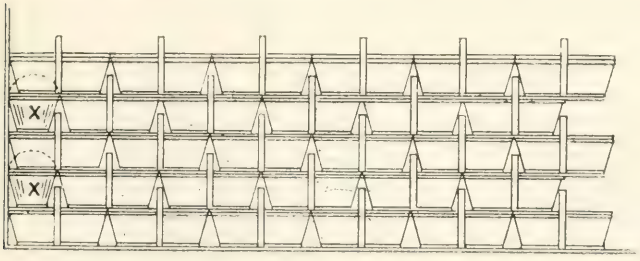
Floor Tier Plan.



Second Tier Plan.

After carrying the first two rows to the height of the load throughout the entire length of the car, continue to load two rows from end to end of the car, until the load approaches the side toward the receiving door. Then arrangements must be made to take up any space which will not accommodate a full basket between the last row and the side wall of the car. This is usually accomplished by dropping the last single row of baskets and criss-crossing or worming a row from both ends of the car to the open doorway, the second tier and each succeeding upper tier fitting criss-cross between the handles of the floor tier or the tier immediately beneath it.

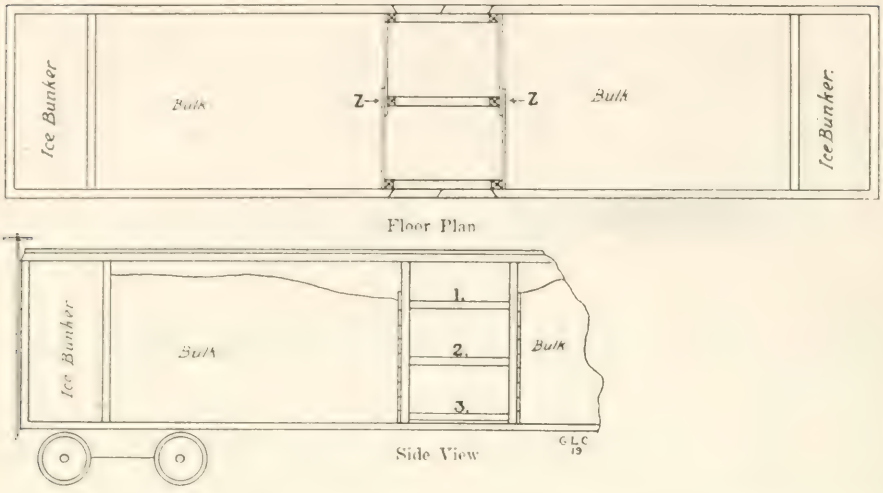
Ninety-eight per cent of the damage to climax baskets in transit is due to shifting of the load sidewise to take up side slack. Criss-cross loading of the last row should eliminate this slack and prevent side shifting.



Side View.

New York Central Lines,
Agricultural Department,
Perishable Freight Division.

PROPER BULKHEADING FOR BULK LOADS OF FRUITS AND VEGETABLES



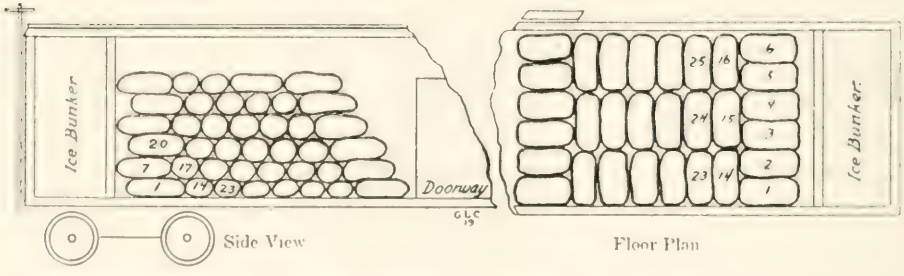
The New York Central Lines, Agricultural Department, Perishable Protective Service, recommends the following construction and materials.

Place a 4"x4" upright from the floor to the ceiling of the car, against each side wall, just two inches back from the door sills, also two 4"x4" uprights parallel between those above mentioned as indicated in floor plan by squares marked X.

Between each set of uprights, securely nailed, three 4"x4" cross braces, one at the bottom of the load, one at the top, and one at the center of the load as indicated by numbers 1, 2, and 3 in side view diagram above.

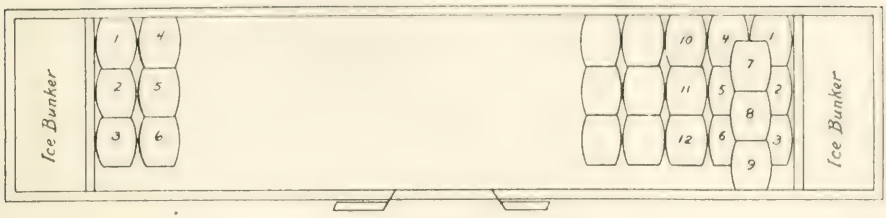
From clear, sound, fresh 1"x8" planking cut panels 6" longer than one-half the width of the car, lap these panels behind the center uprights as shown in floor plan above, note Z. These panels are added as the load increases in height, aiming to have the top panel a few inches above top of load

IMPROVED SYSTEM OF LOADING SACKED VEGETABLES



Place sacks 1, 2, 3, 4, 5, and 6 one-half the width of a sack away from the bunker end of the car. Place sacks parallel to number 7 indicated in side view, with end of sacks in close contact with bunker end of car Then place sacks 14, 15, and 16 as shown in floor tier plan. Next load sacks parallel to number 17 in side view Then place sacks parallel to number 20 in side view. The balance of the load is carried out as diagramed above. In severe cold weather leave out of bottom tier one bag which is loaded lengthwise in every row and turn end to end one bag which is loaded crosswise. This permits a space of about 6" more between the side walls and the sacks on floor tier

CROSSWISE OFFSET LOADING SYSTEM
FOR STANDARD STAVE BARRELS



Floor Plan.

1. Start the loading of the car by placing barrels numbered 1, in diagram above, in the far corner tight against the side and end of the car

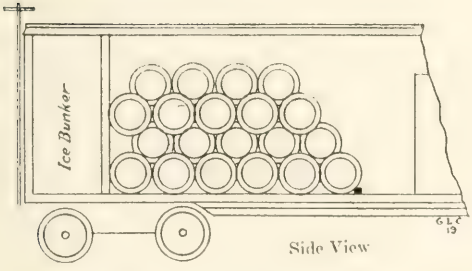
2. Place the next five barrels in each end of the car corresponding to numbers 2, 3, 4, 5, and 6.

3 Chuck a block of 2x4, one foot long, in front of barrels 4, 5, and 6 to hold them in place while you place barrels 7, 8, and 9 on the second tier, forming the first stack from the end of the car in the second tier

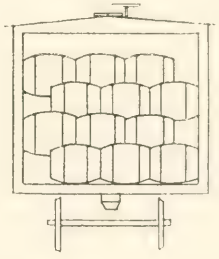
4. Place barrel 10, removing the 2x4 block or chuck from in front of barrel 4, and chucking it in front of barrel 10 Place barrels 11 and 12, removing the chucks from in front of barrels 5 and 6 and placing them in front of 11 and 12 respectively Then lift the second stack of the second tier parallel to barrels 7, 8, and 9.

5 IMPORTANT—Always remove every chuck from the car, for if chucks are left in the car a slight movement of the load will cause the barrels to ride on the chucks, bending or breaking the staves, bruising the contents, which results in decay in storage

New York Central Lines,
Agricultural Department,
Perishable Protective Service.

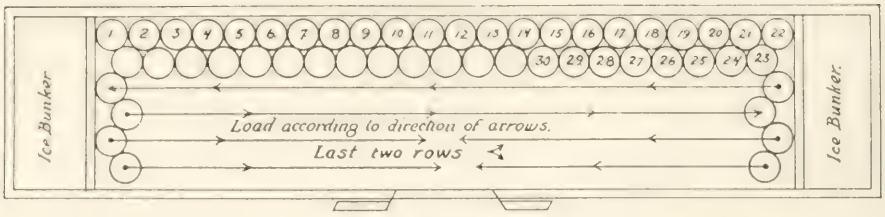


Showing position of last chuck



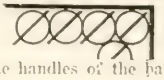
End View.

THE WESTERN NEW YORK END TO END OFFSET LOADING SYSTEM FOR STANDARD BUSHEL BASKETS



Floor Tier Plan.

1. Place the basket numbered 1 in the far corner of the car with the basket handles as shown in the small diagram.



2. Place the first row of baskets along the side of the car, with the handles of the baskets in the same relative position.

3. Adjust the first row of baskets to obtain the proper offset for the second row (the number of baskets along the side of the car varying with the length of the car and the tightness of the loading).

4. The first row of baskets is built to the full height of the load before starting the second row.

5. Each succeeding row of baskets is put in place as shown by the arrows in the diagram.

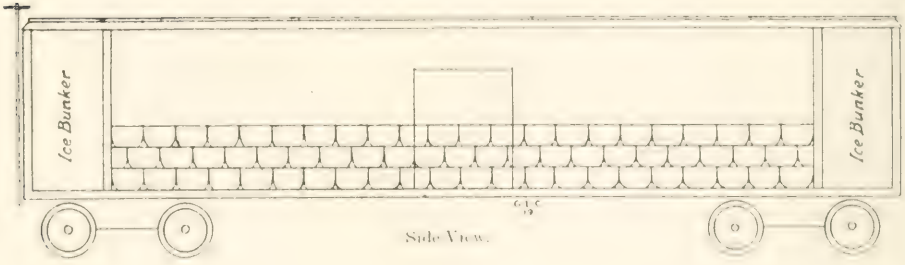
6. The last two rows of baskets indicated in diagram are started from both ends of the car and should come out evenly in the doorway, if the loading has been done properly and with care.

(Figure Below) SIDE VIEW OF LOAD SHOWING FIRST ROW

Always build first row full height of load and full length of car before starting the second row. The adjustment of the first row to arrange for the offset of the second row requires careful attention, for the ease with which the balance of the loading is done depends upon this adjustment.

New York Central Lines,
Agricultural Department,
Perishable Protective Service.

Load according to direction of arrows.



Side View.

Chairman: There is a Gentleman that wishes to get the picture of the Horticultural Society in front of this building directly after we close at noon. So if you will all please come down together and get this official picture. I also wish to say that the Society will meet in the Gymnasium tomorrow instead of in this room or in room 109 as stated in the program.

The next subject will be the Standardization and Transportation by Charles J. Brand, former chief of Bureau of Markets.

Mr. Brand: I want to apologize for writing my paper. But it was impossible for me to prepare myself to speak on the subject without having it written out.

Standardization is an absolutely essential basis of progress. This is just as true of industry, education, and every other field of human endeavor as it is of agriculture. In the development of the production of any commodity, whether of the soil or of manufacture, if large scale output is to be achieved, standards become a necessity.

In industry, standardization means the reduction in number of processes of manufacture to a few specific kinds, and a reduction in the number of products to a few definite types.

During the first year of our participation in the World War, when shipping was so pitifully short due to an insufficient production, submarine activities and extraordinary demand, one of the men from the United States Bureau of Markets was commissioned and sent to France to see what could be done to reduce the number of tools that were required to be transported and kept account of in connection with the Army's mechanical equipment. He found nearly forty different types of hammers in use, wrenches and files galore, and so with other types of equipment and supplies with the result that transportation facilities were more or less gummed up and stock keeping and other related work made to be of wholly unnecessary difficulty.

Standards are of many kinds, depending upon the subject matter involved, but generally those that occur to use are of two great classes, at least so far as they relate to product:

First. Those based upon inherent character whether of quality, condition or quantity.

Second. Those adopted by law, custom or convenience for utilitarian or other purposes.

Standardization in its greatest development is of relatively modern growth. Every step of progress has been made in the face of opposition. The syndicalism that became apparent in England in the cotton industry during the period of the Industrial Revolution was nothing more or less than opposition to standardization then being effected by the introduction of spinning and other machines. Here, as in every other case, the fundamental operation of economic law won the fight for standardization.

An interesting case of opposition to standardization with respect to railroads recently came to my attention; known as the Erie Railroad war of 1853. During the period prior to the Civil War there was a great diversity in the gauge of railroads, and as a consequence, such a thing as a through train was almost absolutely unknown. This was particularly true as to roads leading to the West. The change of gauge at the then small town of Erie, Pa., forced all passengers from New York to Cleveland to change at Erie. The result was that Erie did a thriving

business with the Travelers who were compelled there to disembark and take other trains. In 1853, the New York Line decided to standardize its gauge so that uninterrupted passage would be possible. In December when the word reached Erie that the railroad had begun at the state line to change the gauge, cannons were fired to summon the citizens to a public meeting. A mob quickly assembled, tore up the railroad track, destroyed a railroad bridge, the disorder reaching to neighboring towns. When the work crew changing the gauge reached the outskirts of the Borough of Erie, fresh disturbances occurred in the neighboring town of Harbor Beach where the track was torn up, the grade partly plowed up, and a bridge destroyed. The issue became hotter and hotter until litigation on the subject was carried to the United States Courts. One bridge was torn up and rebuilt four times. A feud between the states of New York and Pennsylvania practically resulted, and cities as distant as Buffalo, Cincinnati and Philadelphia held meetings of protest.

Horace Greeley, caught in the uncomfortable situation wrote in his paper, the New York Tribune: "I was compelled to ride seven miles through a cutting storm of wind, snow and sleet. Let Erie have her way and all passengers and freight must change cars before her pie shops."

Finally, the situation in Erie became so acute that the officers of the railroad company living there were practically driven out of the borough.

It was not until 1854, when the deep and troublesome issue of slavery, in the form of the Missouri Compromise, swept the national mind, that a mutual agreement was reached which enabled the railroad to change its gauge and run its through trains without molestation.

During my researches on standardization, I found many interesting facts. One writer called attention to the fact that in 1820 an army officer in charge of the United States Arsenal at Harpers Ferry had turned out one hundred rifles whose parts were so accurately made that every one of them were interchangeable. This was unheard of up to that time. Today, when war requires the production of tens of millions of rifles, each type with its parts interchangeable, we little realize how important the achievement with respect to the one hundred rifles at Harpers Ferry in 1820 was.

It was my privilege, while Chief of the Bureau of Markets, collaborating with Colonel Francis M. Caffey, Solicitor of the Department of Agriculture, and other assistants, to prepare the Food Control Act so efficiently administered by Mr. Hoover, which played such an important part in our war-time economy. In the first, second and third drafts of that proposed legislation, a section empowering the federal government to establish standards for agricultural and food products was incorporated. Each time misunderstanding and opposition forced the section out of the bill. Finally, the Food Control Act was passed without it, but the Food Production Act had not yet passed. Thereupon I succeeded in getting the section placed in the Food Production Act, but here again, before the bill came to its final passage, the section was lost.

This has been the history of attempts to introduce standardization throughout the world.

With respect to marketing, the subject of standardization, at least for our purposes this morning, can best be considered under four topics as follows:

1—of production methods
2—of products
3—of containers
4—of trade practices and terms.

1—OF PRODUCTION METHODS.

The standardization of Production Methods is important not only to obtain efficiency as to quantity of production, but as to quality and uniformity of production.

To attain standard marketing qualities, the beginning must be made on the farm and in the orchard and truck garden. Great progress has been made with respect to the adoption of commercial varieties. There are hundreds of varieties of peaches and thousands of varieties of apples, but in any given section it is safe to sat that not more than a dozen are of real commercial importance. During the last fifty years there has been a constant reduction and a focusing upon those kinds that combine, in the highest degree, the good qualities that the consumer desires with the characteristics necessary to make possible successful transportation to market.

Production processes must be standardized if a standardized product is to be obtained. An interesting step in this direction with respect to onion production came to my attention in 1919 when one of the American Fruit Growers' Japanese tenants in the Coachella Valley, below sea level, beside the Salton Sea in the torrid Colorado Desert invented a land marking device, on the roller principle, whose use makes it easy to have every individual onion plant in a field of any size, planted in a two-row arrangement with exactly four inches between each onion in the two rows. Here begins the most essential form of standardization of perishable products in an attempt at uniformity in size.

Illustration of progress in a similar direction, but by different means with respect to oranges, has been furnished by the work of Mr. A. D. Shamel of the U. S. Bureau of Plant Industry. There are many unproductive drones among the trees in many groves due to variability in the character and abundance of production of the buds on any individual tree. As a result of Mr. Shamel's work highly productive trees are being used by the nurseries as a source of budwood and trees that make small yields on account of having a large percentage of unproductive branches are having such branches removed with the result that greater uniformity and greater yields have been obtained.

2—OF PRODUCTS.

The standardization of products for marketing purposes rests foursquarely on standardized production, and can never break the limitations imposed thereby except to a certain extent.

We are confronted by a great danger in the United States in the standardization of products. Standardization is a field within which each of the forty-eight states may legislate with propriety with respect to intrastate business. The federal government can function with respect to interstate business, but thus far has done so only to a limited degree.

The result is that we are developing such a wide diversity of state standards as to really threaten the efficiency of distribution through the difficulty which distributors are growingly experiencing in the marketing of the farmers' product.

For instance, about fourteen states now have apple grading laws which differ among themselves. One of the important features of the marketing work of the federal government, in whose inauguration it was my privilege to participate, was the establishment of the Food Products Inspection Service of the Bureau of Markets. The very simple law establishing this service authorizes the Department of Agriculture to inspect interstate shipments of perishable products at the great central markets. How can we expect the inspector performing this service to learn and to apply the many standards now in existence which conceivably might reach the number of forty-eight for each product grown within the United States.

At the meeting of the American Fruit and Vegetable Shippers' Association in Chicago on the nineteenth, twentieth and twenty-first of January, as Chairman of the Legislative Committee, I presented a report which was unanimously adopted calling for the extension of standardization and its simplification by the use of one set of Federal Standards. There was included in this resolution a request upon Congress to authorize inspection at shipping point as well as at market in order that the grower and local shipper might have the opportunity of developing to a greater extent his f.o.b. shipping point market and at the same time lay a firmer basis for satisfactory trading with the distant receiver and for the collection of claims from the carrier.

I have brought with me a set of these resolutions, many of which are of interest to yourselves as much as to the American Fruit and Vegetable Shippers' Association. If the matters so touched upon commend themselves to you, as I hope they may, I recommend the passage of suitable resolutions and their transmission to the Chairmen of the Committees on Agriculture of the Senate and the House, Messrs. Gronna and Haugen, the Chairman of the Sub-committee on Agriculture of the Appropriations Committee of the House of Representatives, Mr. Sydney Anderson, and to your own senators and representatives.

The State of Michigan, and its potato growers, during the winter of 1917-18 gave a very apt illustration of the opposition that sometimes develops to standardization and grading. For purely advisory and voluntary use, the Bureau of Markets issued in 1917 a circular describing the suggested United States potato grades. The experts on perishables of the Food Administration were so impressed with these grades that without consultation with us, under the broad authority conferred by the Food Control Act, they made their use compulsory. I well remember the day when one or both of the Senators from Michigan and practically every member of the House came to the Department to protest against the grades to the text "they will ruin us." In less than eighteen months after this experience, when all of the regulations requiring the use of the grades had been removed, the president of a concern manufacturing one of the best potato graders told me that his sales in Michigan alone exceeded those of the whole United States for a few years before. It is an old story of our fears making cowards of us with respect to any innovation, no matter who handles it, or how carefully it has been considered in advance by practical experts.

Standards are essential to the large scale handling of any product. Contracts cannot be made sufficiently definite nor can they be enforced properly without them. The producer and distributor will not be able to describe with sufficient accuracy what he is selling or the purchaser and consumer to know certainly the character of what he is buying without them.

Standards must necessarily not be too complex where the grower himself must apply them. On the other hand they must be of sufficient accuracy to convey with precision a description of the product. Successful marketing depends upon suitable standards honestly applied throughout the course of travel of the product from the producer to the consumer.

Advertising—that great essential to marketing—is efficiently possible only where there are large quantities of standard products with respect to which the consumer can be educated. The importance of this particular point is recognized by all of the great marketing and distributing organizations. The best illustration in part is that of the California Fruit Growers' Exchange, which distributes no less than 30,000 carloads of citrus fruit per year and has had, in recent years, an advertising appropriation ranging from about $300,000 to $600,000 per year. Our own company, which handled practically 36,000 carloads of all kinds of fruits and vegetables during 1920, has begun an advertising program that will extend over a period of years, planned with a view to giving all producers who employ our marketing services and who conform with our growing and packing requirements the benefit of our advertised brands.

For pictorial and advertising effect, we have selected the name "BLUE GOOSE," with the figure of a goose, to be applied to the higher qualities of all of the fruits and vegetables that we handle. This name and symbol will be popularized as rapidly as possible, and by living up to the high standard we have set for quality, we believe that, as has proven to be the case with respect to the Skookum apples of the Northwest, the Sunkist oranges of California and the Sealdsweet oranges and grapefruit of Florida, that this name, with an advertising campaign behind it, will add real value to every producer's product that is marketed under it.

Standardization of products is an endless subject. On one occasion I held twenty-two hearings in a single month in as many different cities in the United States on the question of standardization of wheat grades alone. What I have said I think will bring home to you the essentiality of standards, if the slogan—THE PRODUCER MUST BE INSURED THE RIGHT PROPORTION OF THE PRICE THE CONSUMER PAYS FOR THE PRODUCT—that has been adopted by my organization is to be fulfilled.

3—OF CONTAINERS.

It seems unnecessary to dilate at any great length regarding the importance of the standardization of containers.

The illustration I hold in my hand shows, better than anything I can say, the paramount necessity for the standardization of containers. At the present time there are currently on the market seventy-four different sizes of hampers, twenty baskets of the usual bushel shape type repre-

senting a bushel and every possible variation of it several times; twenty-five different sizes of baskets customarily known on account of their shape as the market basket.

Efficiency in manufacture of containers and in the distribution of products and just plain ordinary honesty demand a radical change from this situation. The Department of Agriculture has long urged, and the Vestal Bill now before Congress provides for a reduction in the number of hamper baskets to five or six from seventy-four, in the bushel shaped baskets to four from twenty and in market baskets to five from twenty-five.

One of the resolutions to which I have already directed your attention covers this matter as well.

Standardization, particularly when attempted by any one affected interest, or by any agency acting upon its own initiative and not in consultation with an industry, particularly as applies to changes in the shape, size or strength of containers, may operate to the great disadvantage of the grower and shipper. There is a present danger of this character, which does not affect at this moment the State of Michigan, but does affect the whole southeaster territory, in which the American Railway Express Company proposes to forbid the use of bushel baskets for the shipment of peaches and other products. If this movement should extend to the railroad and the Interstate Commerce Commission would permit such an order to be put in force, and force every Georgia peach grower to ship all of his peaches, and every early apple grower in that territory to ship all of his apples in crates, as is now proposed, the price of crates would go sky-high and many growers would not be able to secure sufficient supply for the movement of the 1921 crop.

Climax baskets have already been standardized and their number reduced from thirteen to three, namely the two, four and twelve quart sizes.

The extent to which the illicit use of undersized berry tills prevailed was disclosed by the Bureau of Markets several years ago in the case of Denver, where it was found that hundreds of thousands of undersized berry boxes were brought in in a single year for use in repacking berries and small fruits for retail sale.

4—OF TRADE PRACTICES AND TERMS.

All of the different types of standardization thus far mentioned and soon to be mentioned, bear a very close relationship; each is essential to the other. With respect to trade practices, standardization is greatly to be desired by every factor from the producer on.

When a producer or shipper sells a car f.o.b., it is necessary that both parties to the transaction have the same mental concept of what is meant if the transaction is to prove satisfactory, and the best practice now is to consider the f.o.b. sale to be one in which the commodity quoted or sold is to be placed free on board the car or at shipside at shipping point in suitable shipping condition and that the buyer assumes all risks of damage in transit whether there is a bill of lading to the order of the shipper or not.

Many of you have had personal experiences of a disagreeable and trying character with respect to sales which you had supposed were made on an f.o.b. basis. Not infrequently, no doubt, it has occurred,

as it has to me, that a car supposedly sold, has reached the market only to be turned down by the receiver.

For a number of years I have owned and operated a commercial peach and apple orchard of 120 acres in the hills of western Maryland. Nothing is so disappointing as to sell a car at a satisfactory price, f.o.b., roll it to market and then receive a telegram that it has been declined. Sometimes the market has weakened and the receiver has hence taken advantage perhaps technically or upon substantial ground, to rid himself of his bargain.

A few years ago I sold a car of peaches to Detroit, f.o.b. my station and it did not even pay the freight after standing on the track for a number of days. I believe I was called upon at the moment to make good a deficiency of over ninety dollars on the freight bill. In this case the receiver at the market threw the blame back upon the buyer and shipper because of shortcomings of the carrier, namely slow movement and failure to be iced, and the shipper to whom I sold threw the car back on me. It took the car nine days to reach Detroit and over two days to get from the outer yards to the unloading tracks in Detroit. Fortunately in this case I was able to collect the value of the shipment from the carrier. However, my personal good fortune was no asset to the industry as it meant a practically total loss of a car of good fruit to the consumer and a heavy bill of expense to the railroad.

The avoidance of the economic burden that waste, decay, delay, and other undesirable factors occasion, totaling many millions of dollars per year, is the end toward which every element of the industry should bend its energies.

Sales for shipment at various dates, sales on delivered terms, track sales, and other terms must be equally clearly understood as being uniformly applied if the perishable industry is to be put on a firm and satisfactory business basis. Unfair methods of competition likewise must be avoided. Prompt settlement of growers' account and the strict observance on both sides of all marketing contracts must obtain.

Wonderful progress in standardization has been made in the Anglo Saxon world since the first intimation given in the records of any attempt to establish a standard occurred in 1120 when King Henry ordered that the ell or ancient yard should be the exact length of his arm. Nevertheless, we are only now on the eve of the greatest application of standardization to the problems of industrial, commercial, agricultural and educational progress.

TRANSPORTATION PROBLEMS IN THE MARKETING AND DISTRIBUTION OF PERISHABLES.

There has never been a time in the history of the United States since the development of carriage by rail reached a point of development on a parity with the population and development of the country, when transportation problems played so serious and controlling a part in perishable production.

As you all know, the transportation rates that have prevailed since September 1, 1920, represent an increase of from 50 to 100 per cent over those that prevailed prior to the World War. The situation has now reached the point where many producing sections, particularly

those engaged in vegetable production frankly confess through leading producers that they do not know whether they have an industry or not. By this they mean that they cannot tell whether their industry can possibly survive under the present schedule of freight rates. However, this matter will be developed in greater detail later. For the present, it is sufficient to point out that unless the rates can be reduced in many territories, production will be shifted to new regions nearer to the market of consumption, insofar as climatic conditions will permit shifting.

Our interest in transportation is of two chief kinds—

First—Service
Second—Rates

although these two points do not cover the whole thing.

With respect to service—the question of inadequate supply of refrigerator cars has in the past been the most important factor limiting proper distribution. This situation promises to be greatly helped by the reconstruction of old cars along the lines of the Standard Refrigerator car devised by the Department of Agriculture and now adopted by many of the railroads and by the Master Car Builders Association.

Of equal importance in kind—though not in degree—is the question of heater car service, either in the form of special heater cars for moving products to market from the colder sections of the country like Maine, New York, Michigan and Minnesota, or combination cars that can be used for both refrigerator and heater purposes as may be required. The latter is the more practicable and of the greater importance in transcontinental shipment across the mountain in winter.

In the past, there has been a relative deficiency of high grade motive power. With the reduction in traffic, and with the coincidental increase in motive power, this problem will assume less importance in the future.

One of the most important points in the matter of Service is that of quick schedules. Before the war, as an illustration, cantaloupes from Imperial Valley in California were delivered in Chicago on the sixth day and in New York on the ninth. Under conditions prevailing more recently, eighth and twelfth day deliveries have been more common.

A similar situation applies in other sections of the country and to other products. As recently as December, 1920, we had occasional cars of fruit and vegetables that took from twenty to thirty-five days to make the trip to market. Needless to say products that have tarried that long in transit are frequently wholly unfit for consumption, entailing loss to producer, distributor and carrier.

With the sharp reduction in traffic that has taken place during recent months, the question of schedules has already lost importance, the carriers having cars and motive power to spare. This situation is doubtless induced by two factors:

First: the general depression in business which has caused a let-up in shipment of commodities of all kinds;

Second: the reduction in the amount of traffic offered to the carriers, due to high rates militating against the movement of commodities, like perishables at rates that the commodity cannot bear.

This is illustrated by our present experience in Pittsburgh. Sweet potatoes, now being received from the Eastern Shore of Maryland regularly come through in three days. Only a few months ago, it took six.

Potatoes from Michigan until recently, required from eight to nine days to reach the Pittsburgh market; now they are getting through in four to five days.

It is only fair to say that the lack of refrigerator cars in particular has not always been an unmitigated evil, as on several occasions, inability to secure the full number of cars ordered has resulted in a more even distribution to the markets of the country, preventing gluts with attendant destructive price reactions. The insufficient supply of refrigerators in such cases has also, in its natural operations, forced shippers to weed out their inferior stuff and ship only the better qualities, which has an unquestionably stabilizing effect on the market.

MISCELLANEOUS INCREASES IN TRANSPORTATION CHARGES.

Increases in rates do not represent the only problem confronting the perishable industry at the present moment. Refrigeration rates have been increased in the various territories from 50 to 100 per cent, detention charges have been increased and the time limit on detention has been shortened. Likewise, proposals are now being considered by the carriers, some of which have been submitted to the Interstate Commerce Commission by the carriers requesting permission to put them in force involving—

1st—Assessing rental charges for the use of refrigerator cars in addition to present costs.
2nd—Eliminating storage in transit privileges on box apples.
3rd—Increasing charges for ice supplied to refrigerator cars in all territories.
4th—Establishing charges for heating service through Southwestern gateway where no heater service is required in order to equalize the heater car charges in other territories where heater service is necessary.
5th—Increasing demurrage charges very greatly in all territories.
6th—Increasing heater charges particularly from Maine whose large potato crop must perforce move largely in heated cars of which there is a very insufficient supply.

These and numerous other proposals that are pending are of the greatest interest and importance to you and your industry.

Our organization in common with many others is doing everything within its power to secure fair treatment for perishable products, not only in its own interest but in the interest of the producer and consumer. During the calendar year of 1920, we handled nearly 36,000 carloads of fruit and vegetables. The freight bills paid by us in our own behalf and in behalf of our customers undoubtedly totalled nearly ten millions of dollars. In the presence of the existing declining market, these freight charges frequently represent for this brief though necessary service, an amount greater than the total the producer receives for planting, cultivating, producing, harvesting and shipping his crop, requiring hard work, through a period of many months.

In what I have said and in what I am about to say, I do not wish to be misunderstood as unsympathetic or unappreciative of the problem that has faced the carriers with respect to their necessity for increasing their income so that it would be possible to pay a reasonable return upon the

value of their investment and to pay a fair rate of wages to their employees.

Our organization has always favored fairly compensatory rates and has stressed the desirability of good service rather than rates so low as to make a high quality of service impossible.

Nevertheless, the problem is one worthy of fearless analysis and frank discussion.

If the new rates stifle more traffic than the increase produces in the way of revenue, a disservice may have been done not only to the carrier but to the general public, and to the producer who has spent months, or in the case of orchards, even years in building up his tonnage producing powers.

COMPARISON OF PRE-WAR, WARTIME, AND POST-WAR FREIGHT CHARGES.

To give you a clearer idea of the heavy burden imposed upon perishables by present rates, I am inserting at this point in my paper, a table showing the rates for the three situations that have prevailed in recent years.

FROM	TO	COMMODITY	RATES in cents per 100 Lbs. unless otherwise specified		
			Prior to Jan. 25/18	June 25/18 to Aug.25/20	8/26/20
			1918	1919	1920
Cadillac, Mich....	New York, N. Y...	Apples	.375	47	66
	Chicago, Ill.....		.20/5	25/5	36
Washington.....	New York.....	"	100	125	166/5
	Chicago.....		100	125	166/5
Lockport, N. Y...	New York.....	"	19/5	24/5	34/5
	Chicago.....		21/5	27	38
California.....	New York.....	Cantaloupes	125	156/5	208/5
	Chicago.....		100	125	166/5
Colorado.....	New York.....	"	82/5	103/5	138
	Chicago.....	"	46	57/5	77/5
Arizona.....	New York.....	"	125	156/5	208/5
	Chicago.....	"	100	125	166/5
Cadillac, Mich....	New York.....	Potatoes	37/5	47	66
	Chicago.....		20/5	25/5	36
Minnesota.....	New York.....	"	39	49	66
	Chicago.....		19/5	27	46
Maine.....	New York.....	"	35	44	62/5
	Chicago.....	"	50	64	89/5
California.....	New York.....	Celery	125	156/5	208/5
	Chicago.....		100	125	166/5

FROM	TO	COMMODITY	RATES in cents per 100 Lbs. unless otherwise specified		
			Prior to Jan. 25/18	June 25/18 to Aug.25/20	8/26/20
			1918	1919	1920
Orlando, Fla.....	New York.....	Celery	39	49	65/5
	Chicago.....		31/5	40	53/5
New York.....	New York.....	"	23/5	29/5	40/5
	Chicago.....		52/5	66	92/5
Cadillac, Mich....	New York.....	"	44/5	55/5	77/5
	Chicago.....		28/5	36	51
California.....	New York.....	Oranges	115	144	192
	Chicago.....		115	144	192
Orlando, Fla.....	New York.....	"	61	76/5	102 per box
	Chicago.....		68	85	113/5 per box
Michigan.....	New York.....	Onions	37/5	47	66
	Chicago.....		20/5	25/5	36
Texas.....	New York.....	"	98/5	124	165/5
	Chicago.....		65	81/5	110

APPLE RATES FROM MICHIGAN.

I want to direct your attention first to a few rates on Michigan important perishable products. In the case of apples, for instance, from Cadillac to New York; prior to June 1918 the rate was 37.5c per hundred From July 1918 to August 1920, it was 47c per hundred. Since the going into effect of the last increase in rates, about the first of September, 1920, it is 66c per hundred; an increase of nearly 30c per hundred, or about 90%. The Chicago rate from Cadillac on apples used to be 20.5c per hundred; during the war it was raised to 25.5; after the war it was raised to 36c per hundred.

POTATO RATES FROM MICHIGAN.

Identically the same schedule of rates applies to potatoes as applies to apples, in spite of the fact that apples are generally of very much more value. This suggests too, the important thought that low grade apples, wasty, decayed and relatively less valuable, cost just as much to move by freight as fancys and extra fancys. It is a serious question whether low grade perishables can be moved, in spite of their great utility in many situations, under the existing high freight rates.

CELERY RATES FROM MICHIGAN.

As is well known, Michigan produces some of the finest celery that is grown in the United States. It is widely distributed and highly

prized in many markets. Before the war, the rate to New York per hundred pounds was 45.5c; to Chicago 28.5c. During the war, the rate was raised to 55.5c to New York, and 36c to Chicago. Last Autumn, the rate to New York was raised to 77.5c, and to Chicago 51.5c.

Michigan is by no means the greatest sufferer. The real sufferers are Washington and California, and to only a slightly less extent, Florida. It used to cost $1.25 per hundred to ship cantaloupes from California to New York. It now costs $2.085 per hundred. The freight on oranges formerly from California to New York was $1.15; now it is $1.92. The celery rate from California has been increased in exactly the same proportion as the cantaloupe rate. It is no uncommon experience to pay from $500 to $800 freight on a single car of oranges, cantaloupes or grapes from California.

The case of the California lemon grower is almost pathetic. There is a plentiful supply of cargo space on practically all ocean carriers. Ocean rates have been reduced since the war to an extraordinary extent. Inland rates, in the meantime, have increased very greatly. The Sicilian lemon grower and shipper can place his product practically throughout the eastern United States, shipped all the way from Italy, at a less freight cost than our own California shipper must bear. My own organization is a large grower of lemons in the hillside section around Corona, California. We have had the experience during the past Autumn of paying $1.66 per box freight on fruit that sold in the New York market as low as $1.25 per box.

The result on shipments was readily apparent when the new rate went into effect. From a movement of about 35 cars per week, it dropped to 6 or 8. The increase in lemon rates has been about 75c per hundred pounds. The result is to choke off distribution. To come out whole on his picking, packing and loading labor, his paper, nails, wraps and other packing house supplies, and on his freight, the grower would have to receive at least $2.75 per box, and in many cases as much as $3.00, without considering any possibility of a credit upon his growing costs. It costs even the relatively efficient grower around $3.00 per box to grow his lemons and place them on board car, ready for shipment.

The effect of this situation upon the railroads, I believe, has not yet been sensed by them. Gradually growers will be forced out of business and the increased rate instead of being a revenue producer will be a revenue reducer. I believe that the Union Pacific in Idaho has already found this to be the case with alfalfa hay. No alfalfa was moved, and the railroad, in order to induce a movement, cut the rate in half with just the result you would expect, namely, the stimulation of immediate shipments. The railroads may readily find that this excessive increase in rates, so far as perishables are concerned, may kill the "goose that laid the golden egg."

The situation in the apple sections of the Northwest is similar and no less serious. The rate from all shipping points in the State of Washington to New York and Chicago is identical. Before the war, it was $1.00 per hundred, then it was raised to $1.25 per hundred, and how it stands at $1.665 per hundred. In spite of the best efforts of the most up-to-date producers of apples in the world, the Lord will make little apples, and not all apples will be fancy and extra fancy. C Grade apples will be

produced in spite of every precaution. It is a serious question whether the two latter qualities can possibly be marketed under the existing freight rate, in spite of its thoroughly useful character. The result is to keep many a consumer from having any apples at all. This particular situation is aggravated by the fact that the State of Washington does not at the present time enjoy the benefits of a lower bulk rate; in other words no rate at all on bulk apples shipped in cars is applicable at this time. Hence, they are not only forced to pay high freight rates on the lower grade stuff, but they must be packed in expensive boxes, costing during the last three years, from 25 to 35c per bushel box.

I do not wish to draw the picture too discouragingly, but perishable industries representing in the Pacific Coast and Northwestern States an investment of easily a billion dollars, have their future fate tied up in the present freight rate. Congress and many good friends of the Farming Industry forced the resuscitation of the War Finance Corporation in the expectation that it would be a help to our growers. There is a bare possibility that it may be: on the other hand, what is needed is not steps that will hold prices up to the consumer, but action which will put goods within the consumer's reach so that he can consume more freely, thus encouraging production and furnishing tonnage to the carriers. Little good can come from uneconomic palliatives for our potato situation, when Danish and Scotch potatoes can cross the ocean at a less cost than our inland freight from points upstate in New York to New York City, or from Maine to Boston, New York and other logical outlets for Maine potatoes. The rate on potatoes from Maine, by the way, to New York, has been raised from 35c to 62½c. Needless to say, we in common with every live organization that has ideals for the future progress of the perishable industry in the United States, are doing all we can to bring about an amelioration of existing conditions. We are interested, not only because of the great quantities of the commodities we handle on a merchandising basis and the very much greater quantities that we handle for growers accounts on consignment, but we are gravely interested as producers, owning, leasing and operating at least 16,000 acres of orchards, groves and gardens. We know the growers' problems and when we work for him, we are at the same time working for ourselves.

At the present time, our producing properties are scattered from Pennsylvania to Washington, and from California to Florida. We try to be a real factor in the life of every community where we own properties. We realize that we lose a certain amount of efficiency that exists when the individual owner of an orchard operates his own place. However, we selected our Managers from the class of Agricultural College graduates and practical fruit growers who have their heart and soul in their work, and in the communities where they live, and who, while not owners of the individual properties they supervise, are nevertheless stockholders in the corporation, so that their interest in efficiency is very greatly stimulated. There are other gains to large scale operation in the way of purchasing barrels, boxes, baskets, fertilizer and farm equipment and supplies of every kind at wholesale price. I have visited every property in the United States that we own except one, and I have accurate reports on that one, and I am able to say that every one of them is a greater asset to the community because of higher productive condition than it had when we purchased it. Many of our properties were purchased at

relatively low prices because of run-down condition. They have been rehabilitated, and are producing more and better fruit than they ever have in the past.

After several fat years in the fruit industry, we have now come to a time when decline in prices, high costs and other factors are going to eliminate the unfit. The successful orchardist, vegetable grower or shipper, is the one who weathers the misfortunes of lean years and converts them into opportunities for success. My many years of public service, naturally and inevitably color my view of the duty an organization like ours owes to the industry. In this our whole staff of Executive Officers are in agreement with me. We are looking not only to the success of our individual organization, but we wish to help to make the perishable industry as a whole, one of the stable businesses of the country. "To convert it," as our President, Mr. Crutchfield, often says, "from a risky business into a business of risks" by wide-spread operation and thoroughgoing organization, securing modest average returns over a period of years, rather than have a feast one year and a famine the next.

WEDNESDAY MORNING.

The meeting was called to order at 9:00 A. M. by the Chairman, Mr. G. A. Hawley.

Chairman: Now is the time for any questions that you want to bring up.

Question: Do red raspberries need tipping like the black ones?

Mr. Farrand: I have never tipped a red raspberry. I understand you need not for they don't throw out laterals like the black ones.

Question: Is nitrate of soda worth as much as a fertilizer as sulphate of ammonia at the same price per ton?

Mr. Farrand: Sulphate of Ammonia has about 25% more nitrogen than nitrate of soda, and should be worth that much more in proportion.

Member: When you can buy it at the same price I wondered why the difference?

Mr. Farrand: It is news to me if you can buy it at the same price. By all means buy the Sulphate of Ammonia as it carries 25% more nitrogen than the nitrate of soda if it can be bought at the same price.

Member: I have a question written out on that very thing. Can't something be done by the Farm Bureau to get a reduced price for the farmers and fruit growers on Sulphate of Ammonia? Instead of paying $100 per ton why not get it for half as much as that. Sulphate of Ammonia is a by-product of coal burned in the factory near the mouth of the coal mine.

Question: Is it a by-product of coke?

Member: That is a question that I cannot answer. That is a question for the State Farm Bureau to work out. Whether it will be the policy of our National Farm Bureau to go into the Manufacturing of coke and in that way get the supplies of Sulphate of Ammonia I don't know. Maybe you could answer something about it.

Member: The only thing that I know of what we could do today for this Association is to pass a resolution for the Farm Bureau to take hold of it. It don't seem right for us to pay $100 per ton for that by-product. If it is in order I move that a resolution be made to that effect.

Chairman: We will refer that to the Resolutions Committee. I will appoint that Committee as soon as we get through here.

Question: I understand that the farmers can get it from the Farm Bureau at $81 per ton.

Mr. Farrand: The last I heard was $87 from the State Farm Bureau. If it is $81 that has dropped down very much.

Chairman: Any other questions?

Question: What are the principal causes and preventions for pear blight?

Mr. Marshall: Pear blight is caused by bacteria which may be carried from one tree to another in the spring, usually about the time the trees are in bloom. At such time there may be cankers on the blighted trees and usually a sort of a sap exudes from these cankers. This sap is sweet and bees like it and they will carry this to the blossoms when the trees are in bloom which results in blossom, spur and possibly twig pear blight. If the conditions are favorable it may grow or spread back into the branches.

Concerning the control of pear blight, we can't say any more now than probably 25 years ago. Cut out the blighted twigs below the brown bark and burn them. In some sections, practically in the Northwest, they have pear blight cutting campaigns. They go through an orchard and cut out all the blight to be found. That is the way they keep it under control. I do not think pear blight is very serious in this section of the country. I have seen pear blight bad enough to make an orchard appear almost brown in the spring and summer. That cuts down your crop for that year. It would be impractical, and the cost would be too much to attempt to cut out all of this blight. Many times these same orchards will not show any blight at all the following year.

Question: How do we get the blight when it is found in the body of the trees?

Mr. Marshall: I should have said that these bacteria may enter the trees through any wound or break in the bark.

Mr. Crane: We are somewhat of the opinion that ants carry pear blight during the summer season. They are very active on trees and we wonder if tangle foot would have any effect of keeping them off of the trees. I have raised pears for 30 to 40 years now and have specialized in pears considerably. When I was active enough, I did all of my own pruning, when I looked over my own pear trees. I did not allow the Farm Bureau to do that or any man for I thought I was a little keener of observation than they were. So always in the month of March I went over my pear trees and I got so that I could discover the limb that was going to have blight the next summer from the discoloring. You can always tell a healthy tree by its color. I used to as a rule cut out every limb that had a discolored appearance. I marked that tree and found that it developed the blight the next year. My son has been going through the pear orchard this winter and cutting out every limb that showed signs of blight. There seems to be no cure only to get ahead of it. If it starts in a limb you have to cut it away below to get ahead of it. If it gets in the body we cannot control it. We can keep it down in this locality as well as anywhere in the United States by observation and great care of our pear trees. I was wondering if the tanglefoot would have any effect of keeping the ants off of the trees. In the

summer flies and bees will carry the bacteria to tender spots in the trees that we do not know about. We ought to find out some preventives for pear blight for it is very serious in some localities.

Question: I would like to ask if cultivation and pruning have anything to do with the spreading of blight.

Member. Yes, I believe that heavy cultivation and heavy pruning would put the trees in a condition that would produce blight. It makes a weak, tender growth and under that condition the tree is more susceptible to blight.

Question: While we are on this subject of pears I would like to know if we could control pear psylla?

Mr. Crane: I want to give you the latest I have on that pear psylla. Of course, they tell us to fight the flies, I have the book from Ontario, Canada, where they carried out an experiment that looks very good to me. I am going to try it anyway. They had a bad time of it in 1917. Their trees were just covered with it which was a great injury to their crop. Their Department took hold of it and carried experiments of something to go by the next summer and so they went into the greenhouse. They put some trees into the greenhouse and started the flies to working on them and they simply covered the trees with eggs. They sprayed the eggs when they had been laid four days. It takes them a period of from four to ten days to lay their eggs. During those four to ten days they made up different formulae of spray. They used 1 to 7 lime sulphur, 33 test and their count on eggs was every egg killed that the spray came in contact with that had been laid for from four to ten days and in the formula of one to nine and one to ten they would not average over 75% killed. They further tried an experiment of one to ten with addition of starch. They used two pounds of starch to 40 gallons of one to ten of the lime sulphur. This seemed to kill them 100%. There are always a few eggs that are laid after that period of ten days and so they followed this up in the blooming period. They used their poisons in the rest of the work and they caught the eggs in that stage. They carried this on in two large orchards the next summer with perfect success and the check rows in those orchards were just covered with psylla. This sure looked good to me. Spray just before the cluster bud begins to open up. A tree sprayed with a strong solution at that time will also kill any scale that is present.

Chairman: We will have another opportunity for more questions at the end of this session. I think we had better take up the next topic. We will have time before dinner to continue this question. As it is very important we will suggest to the Horticultural Department that they do a good line of work on pear Psylla. Is Mr. Low in the room? As he is not we will pass over this topic and take up the "Practical Experiences with Commercial Fertilizers." This is divided into four parts and the first is by Mr. Anderson on "Peaches." Mr. Anderson is not in the room so Mr. Buskirk who has the section on "Grapes" will speak on that at the present time.

Mr. Buskirk: Mr. Chairman, Ladies and Gentlemen: You will pardon me if I speak on notes on this subject. There are two or three reasons for that. One of these I feel about this subject as a boy in an orchard who got caught stealing apples. The owner met him at the gate and asked him what he had to say. He answered, "I haven't anything to say."

Until the last three years the grape farmer has been sailing close. He did not have much money to put into commercial fertilizers unless he got money enough from outside sources and then he did not place it in the grape business for it was not a paying proposition. With what experiments I have carried on it takes two years to get results from commercial fertilizers on grapes. A man who gambles very much or sails uncharted seas sails pretty close to the shore so if anything occurs he could get out all right. There has been other reasons for that. Our labor conditions, our young men who were on the farms a few years ago have left us in the lurch. The farmer is looking for quick returns and you cannot get them in the grape proposition. With our fertilizers, nitrate of soda, which has been used quite a little we could see results the first year; the other fertilizers we could not. I think the fertilizer which has been used the most is bone meal. We have had very good results from bone meal. We throw broadcast two to five hundred pounds of bone meal to the acre and put it by handfulls around the vines. I have used bone meal and wood ashes mixed half and half. A number of years ago I used fertilizer on the light places and they began to bear two years before the vineyards where I did not use any fertilizer. In places I used bone meal alone and ashes alone. I think the bone meal was the one that had the best results. We have been shipping in a lot of stable manure but it was very deficient in potash. We have got to use potash somewhere and lime. We are using more lime than we did. I can't say that I received any results from lime but I could raise a cover crop. It takes quite a while for our fertilizers to act on grapes. Even our stable fertilizer we use takes two years to get good results. We used the stable fertilizer on 16 acres two years ago and we had a moderate crop the first year in grapes but we got results in foliage. The next year the crop on that 16 acres doubled the last year's crop but it took two years to get the results. I am inclined to believe that we have got to build our grape vine the year before we build our crop. The one that uses commercial fertilizers this year will not get results the same year. Our County Agent has been carrying on experiments with lime rock and Acid phosphate. Up to that we haven't anything definite to back on. Mr. Larkins is using nitrogen. Claims he gets results. They are coming back to the Phosphate. It was used two years ago in a vineyard I was watching. We did not get any results from that the first year and a freeze came and our grapes fell to the ground. The second year was better but we lost them on account of the frost. I know of a vineyard that was started three years ago of two acres. The first year they only received 500 pounds of grapes off of it. This has been carried on for four years and they got six tons off of the same vineyard coming up every year by the use of bone meal.

Question: They did not use any cover crops?

Mr. Buskirk: No cover crops were used. But they had a nice weed cover crop that you do not get when you do not use bone meal.

We could have been called a miner or a slave for we mined our soils and drove the whole family to work to make things come out right at the end of the season. We hardly dared keep books. Three years ago a little Farmer's Club appointed a man to keep books on the grape business. When the end of the year was up we called for the report. He said, "I have not much of a report and if I had kept them six months longer I would have went bankrupt."

I used last year a commercial fertilizer which I purchased from the Farm Bureau. It was half bone meal and half acid phosphate. I liked that very much as the acid phosphate mixed with the bone meal stayed through for two or three years. I have had better results in getting a cover crop since I have been using the acid phosphate. We are going to try this coming year with nitrate of soda and potash but we have not any definite results that I have been able to find anywhere. We are going to grow our nitrogen.

Question: What do you grow for nitrogen in grapes?

Mr. Buskirk: I personally would try the sweet clover. I think the sweet clover is going to be a winter plant. Some use rye and vetch and vetch has been used for the last seven or eight years as a high producing plant. Rye and vetch in a large vineyard gets the start of me. You can use a farm plow. I dislike a disc.

Question: How deep do they plow the vineyard?

Mr. Buskirk: About two inches. Just enough to turn the ground over. We have got to have something for a cover crop that we can get on and plow late in the season. I have serious doubt if there is any fertilizer that would pay you the money that bone meal or acid phosphate do.

Question: Don't you have to keep the commercial fertilizers up?

Mr. Buskirk: You can use cover crops if your land is in the right condition. You have got to continue using something. We have mined these grape soils for 30 years and we have got to put something back for 30 years.

Chairman: We will reserve our questions until we get through with the topics along the line of fertilizers.

We will now hear from Mr. Hamilton on Fertilizers pertaining to "Apples."

Mr. Hamilton: Mr. Chairman, members of the Michigan State Horticultural Society and friends:

A number of years ago I heard a lecture on the use of commercial fertilizer delivered before this society in Grand Rapids. It seemed to me to be very clearly demonstrated by the gentleman handling the subject, that in Pennsylvania in a series of years, acid phosphate in connection with nitrate of soda, added much to the growth of the apple trees and the quantity of fruit produced.

The next spring after this meeting I bought two sacks of acid phosphate, with the intention of using it in conjunction with nitrate of soda, as an experiment. I found after getting the acid phosphate that I could not obtain nitrate of soda, so decided to use the phosphate alone. About blossoming time I told one of the men to weigh out five pounds of acid phosphate into a pail, counting the number of handfuls it took to make five pounds, and apply an equal amount to all of the trees in one row of apples in the old orchard, distributing it evenly over the ground as far out as the branches of the trees extended. I was busy at the time and in about half an hour or less the man returned reporting that the fertilizer had gone a little over two rows. Naturally I was provoked because in scattering the acid phosphate he had gone over double the number of trees I had intended, and put it on about half as thick as I had instructed him.

I explained to him this was an experiment in which I was deeply interested, and I was very much disappointed because he had put it on

only half as thick as it should be, but I said, "Jack, now you have a pretty good idea how much 2½ pounds are, go down to the young orchard, take one row and be careful and put on the same amount per tree as you have been sowing under the old ones. In a short time the man was back well satisfied this time he had done his work in the proper manner. I asked him how far this second sack had gone and he replied about half way through one row. I was thoroughly vexed, because without counting the trees I realized too late that he had put on this acid phosphate much heavier than I had planned.

The young sod mulch orchard where he had distributed this fertilizer was on an average of possibly ten years of age, and this particular row where the acid phosphate had been scattered extended about ¼ mile covering various types of soil, mostly sandy loam and rather light, but crossing some heavy soil, and passing through rather a low spot which had more or less of the wash soil from adjacent higher ground. It developed that the man had put around these little trees twice as much per tree as he had put on the 40 year old trees, or something like five pounds. However the work had been done and there was nothing to do but watch results. During the summer I could not see that the application had benefited the old trees in any way. The small amount of two and a half-pounds over a 40 ft. circle did not even affect the grass.

In the young orchard in a few days the grass began to turn a darker green, weeds of all kinds began to outstrip their neighbors in growth, the foliage on the trees began to grow with added vigor, the terminal shoots of the trees pushed forward much faster, fruit buds seemed to form in greater numbers and all summer you could tell this particular row of trees by its dense black foliage as far as you could see the orchard, all because of the mistake Jack made in applying somewhere near the proper amount of acid phosphate. The fruit which hung on these fertilized trees during the first summer was larger. In fact after we were through packing Transparent I found a very large specimen which had been missed in the picking. I took it to the manager of our fruit exchange and asked him what kind of an apple it was and he confessed that he could not name the variety. The apple was as large as a good sized Pound Sweet and looked much like it.

The texture of the fruit on the treated trees the first year was not quite as good, nor did the fruit have as fine a finish as on other rows, there being an indication that possibly a slight excess of acid phosphate had been used, as there was just a little tendency for some of the apples to be coarse, some were affected with Baldwin spot, and even a few had water core. But these little deficiencies were more than over balanced by the added size of the fruit.

The type of soil covered in both old and young orchards as mentioned would be termed as a whole rather sandy, but the experiments covered some pretty heavy soil, and the benefits resulting during this season seemed to show very strikingly all summer in the young orchard, as much on the low ground and on the clay as on the sand.

The next spring the trees which had received an application of acid phosphate the previous season blossomed much fuller, and had I spent a few hundred dollars for acid phosphate in the spring of 1918 and received the same results on all my orcharding I believe I would have been better off to the extent of a few thousand dollars in the fall of 1919. I would

say that the Yellow Transparents which had been treated had nearly doubled the quantity of apples. Wealthy contained more, it increased the yield of the Grimes a vast amount. Steel Reds just coming into bearing had from a few apples to a bushel per tree, and I do not believe on the other ten or fifteen rows of apples in the sod there were more than a dozen Steel Reds all told.

Going back to the early spring of 1919 on account of the splendid results I had obtained in my little experiment the previous year I decided to use more acid phosphate, and applied in the neighborhoood of eight tons to my bearing orchards, trying to apply as nearly as possible from eight to ten pounds per tree on the old trees and about four pounds per tree on the younger ones. In 1919 I was able to get some sulphate of ammonia in addition to the acid phosphate. I applied this to one row across the young orchard putting on about 2½ or 3 pounds per tree, and it is worthy of special mention that a part of this particular row where the sulphate of ammonia was applied, crossed a part of the orchard which was under cultivation. And what was the result with all this expense and work? I could see no beneficial results whatever on tree growth, or foliage all summer where I had applied acid phosphate alone on the sod portion of the orchard. What was the trouble when I had derived such striking benefits the previous year? Was it the season? Possibly in part, but I am inclined to the opinion that I did such a thorough job of spraying during the early summer in my frantic endeavor to eliminate scab that I burned off much of the foliage with the mixture used. It is interesting to note that on the sod, where the sulphate of ammonia had been applied in addition to the phosphate, in spite of the burning tendencies of the spray mixture used the foliage remained fine and thrifty all summer, as did the whole block under cultivation, which understand had a good application of acid phosphate with but the one row receiving in addition the ammonia. These trees under cultivation received thorough culture—a cover crop of vetch and rye having been turned down when the rye was about two feet high. Where I had used the ammonium sulphate on the sod the foliage remained as good as the trees under cultivation or nearly so. This particular part of the row in the sod which had received sulphate of ammonia in addition to the acid phosphate, produced an abundance of fruit buds, and held the foliage until late fall. There was no apparent benefit resulting in the part of the row in the cultivated portion where the sulphate of ammonia had been used over the balance of the orchard under cultivation. This would prove to my mind so far as my soil is concerned sulphate of ammonia, or nitrate of soda would not be a paying proposition if acid phosphate was used in conjunction with vetch and rye or some good nitrogenous cover crop and cultivation methods employed.

Last spring I bought a duster, and while I am still a little skeptical about its controlling scab and worms as well as the liquid spray, I certainly did not burn off my foliage, and it was a great contrast to the foliage seen by many members of this society the year previously. I am still of the opinion that part of the good foliage however may have been due to the acid phosphate applied in 1919 but I used considerable nitrate of soda and sulphate of ammonia this past summer. The nitrate of soda was put on rather late, a little after blossoming as I remember. The foliage I believe was benefited and I am confident I will get good

returns on the money expended in added fruit next fall where it was applied. The sulphate of ammonia came too late to do much good and was distributed about the middle of June. While it had some effect upon the foliage I question whether it has added materially to the fruit buds, but as my foliage as a whole was good last summer, if I am not mistaken the trees have plenty of fruit buds for a crop of apples next fall, the fertilized portion showing up somewhat better than the unfertilized. But what effect did I have relatively speaking where I had used Sulphate of ammonia on the orchard the previous year in my apple crop last fall? On the cultivated area where I had used nitrogen on the one row in addition to acid phosphate I could see no marked advantage over the balance of the trees under cultivation, the apples were no larger, the trees no fuller, and the trees had no perceptible added growth over the others.

Where ammonia had been applied to the trees on the same row in the sod it had increased the yield double over others in the sod I would think, and had added materially to the growth of the trees, and was money well spent. Some are under the impression that acid phosphate will add color to apples. On my soil it does the opposite as I believe will be found true with anything which adds vigor, growth and foliage to the trees. Too much either acid phosphate or nitrogen will make apples more inclined to coarseness, Baldwin spot, water core and a deadening of color. It is my opinion the proper amount can only be told by experimenting, with the various types of soil and conditions of culture. If apple trees are not vigorous and the soil is badly worn out no doubt acid phosphate and chemical nitrogen will prove their worth on the average Michigan soils, under either sod mulch or cultivation. With cultivation good soil and plenty of humus and nitrogen in the soil, my experience would lead me to believe that acid phosphate alone would be the thing to add, as I think it has been found that most of our soils lack phosphorus, but under such conditions I would be a little cautious in using much commercial nitrogen. With acid phosphate and a good cover crop of vetch and rye and cultivation I have found my orchard carrying as heavy loads of apples as I would want during the last two years with prospects of a bumper crop again next year and no helpful signs showing where commercial nitrogen was used in addition to the phosphate. But on sod my observation would indicate that a liberal use of nitrogen in some form and acid phosphate would improve the general health of the tree, and add much to the crops as certainly my experience in using acid phosphate alone on my sodded orchard in 1918 and the subsequent crop harvested the next year proves without doubt it was beneficial to a high degree and my experiment in 1919 and the subsequent crop in 1920 indicates the value of commercial nitrogen in apple raising on my type of soil.

My advice to apple growers who have not already used commercial fertilizers is to at least try them out in an experimental way, especially sulphate of ammonia or nitrate of soda and acid phosphate. You may be astonished at the results.

Chairman: Mr. Flory of South Haven will now take up the subject on Small Fruits.

Mr. Flory: Mr. Chairman, Ladies and Gentlemen: My experience with commercial fertilizers is simply a personal matter with me and used mainly with gooseberries and currants covering a period of ten

years with what I could find available on the farm. Wood ashes, barnyard scrappings mixed with acid phosphate applied among the bushes and cultivated. I used this for a few years until the Pulverized Sheep Manure came on the market. That appeared to me to be about the thing. I mixed this pulverized sheep manure and acid phosphate pound for pound, scattered it under the bushes four handfuls to the bush and cultivated that in. That method was followed for several years alternating every three years by barnyard manure. I used this method up to last year when not being able to get this pulverized sheep manure I purchased the sulfate of Ammonia. I thought if it would be good for other fruit it also would grow berries. I therefore purchased that as I said before and plotted one patch of a thousand bushes in six different plots and using the following mixtures on the plots.

Plot No. 1. I used a mixture of two pounds of sulfate ammonia, three of acid phosphate and three pounds of sheep manure which I had left from previous years.

Plot No. 2. Two pounds of sulfate, two of acid and two of bone meal.

Plot No. 3. I used pound for pound.

Plot No. 4. I used only sulfate of Ammonia.

Plot No. 5. I used sulfate and acid phosphate.

Plot No. 6. I used two pounds of sulfate of ammonia, three of phosphate and two of bone meal.

My prospects were very promising but a late frost coming along and getting my Downing Gooseberries left me a very light crop in the Downing. The Houghton being more hardy gave me a very good result the best I have had in the growing of berries. Another patch which I had used about the same methods except the Ammonia which I could not procure but the results were very different, practically 40% less than on the first patch, therefore I attribute that to the sulfate.

The currants were treated practically along the same lines. They had one application to my knowledge in the last ten years and that was followed with nitrates in the way of hen manure scattered around the bushes as I got them along. I got very good results. I expect to follow the application of hen manure with the acid phosphate this next season. I think the combination will be very good. I think the berries were very good in quality and quantity. With the cap fruit I have had no experience whatever in the Commercial fertilizer proposition. I think this is all I have to say.

(Applause)

Chairman: I wish to announce the Resolution Committee, Mr. T. B. Woodman, Robert Anderson and Geo. Friday.

The following resolutions were adopted:

1. Your Committee realizing that the Horticultural Building, Laboratories equipment and cold storage, are inadequate to give efficient service for Experiment Station work to meet the needs of the increasing fruit interests, urges the officials to take such action as will meet the demands along these lines.

2. We wish to especially express our appreciation for the courtesy and hospitality extended to our Society at its first meeting to be held at the Michigan Agricultural College with especial mention of the Buffet luncheon served by the Horticultural Club students and recommend that consideration be given to hold other meetings at M. A. C.

3. We congratulate the Horticultural students on the splendid show on Exhibition at the Armory.

4. We also wish to express our appreciation to Mr. Chas. J. Brand, Manager of the American Fruit Products Inc., Pittsburgh, Pa.; Mr. George L. Comlossy, Superintendent of the Perishable Products Service, N. Y. Central Lines, for their splendid addresses to our growers. Also, to our own local fruit growers, retiring Secretary Mr. George M. Low, Robert Anderson, Carl Buskirk, W. L. Hamilton, H. E. Flory, E. E. Slater and J. A. Barron who took part on the program.

Chairman: We will now hear from Mr. Robert Anderson as to his experiences with Commercial Fertilizers pertaining to "Peaches."

Members of the Horticultural Society: While there are lots of things which might be mentioned in regard to use of Commercial Fertilizers I shall try to describe a few in hopes that more may be brought out in later discussions.

It seems useless to mention why we should use commercial fertilizers as we all know that with increased cost and scarcity of manure some way must be solved for fertilizing our trees if they are to produce big crops of fruit for in the majority of cases in the use of manure the rest of farm suffers or rather it is a case of robbing Peter to pay Paul.

As a peach is a heavy feeder of nitrogen it usually responds to the use of some nitrogenous fertilizer, in increased vigorous growth, richer foliage and better setting of fruits which is of more benefit in years of light crops.

We aim to supply from two to three pounds per tree of either nitrate of Soda or Sulfate of Ammonia on trees over five years old and from one-half to one and one-half pounds on trees under that age. There does not seem to be any difference in results from either of the above forms of nitrogen although it is claimed the sulfate does not prefer an acid soil. Perhaps the continued use of sulfate may require an application of lime to correct acidity produced.

One of the main important things as regards to the use of nitrates is to be sure they are applied early in the season as soon as the leaf buds open or show green. I have never seen as good results when the materials are applied later in the season because it is early in the season before the bacteria in the soil become active that you want the nitrogen applied to give the trees a good start.

The use of acid phosphate does not seem to give such quick or direct results as the use of nitrate but indirect results through better and increased growth of cover crops and more annual crops of fruit. We are using from 300 to 400 pounds of acid phosphate per acre spread broadcast through the rows. Results from the use of potash are not very definite as it was practically impossible to purchase it during the war and the price was also prohibitive.

It seems there has been lots of mention made in regard to use of potash for fruit trees as to the coloring of fruit. I have sometimes wondered if there was not some delusion for the reason that in comparing results of plots fertilized with nitrogen against those fertilized with potash. The trees fertilized with nitrogen are usually later in maturing while those fertilized with potash are more mature thereby having more color. I have seen no direct benefits from the use of lime on an orchard except indirectly through the cover crop. With the increased use of nitrates

I am favoring the use of rye more as a cover crop because it makes a large growth early thereby enabling you to plow your orchards early before the moisture is all gone.

We got just as good results from sulfate as we did from nitrate. Our results from the use of potash are very indefinite as practically for the last three or four years it went out of sight and was impossible to get. There seemes to be less mentioned in regard to the use of potash. When you fertilize with nitrates they have the effect of producing heavy foliage. I am more and more coming to use rye with a heavier dose of nitrates in spring on some of the humus cover crops. That grows very early so you can plow it under early. As to the over-dose of nitrates, I have not yet had any bad results of the over-dose of nitrates and I am going to keep on as long as I see good results.

Chairman: If there are any questions along this line of Fertilization this is the time for them. We can take a few minutes. There is a Gentleman right here to answer your questions if you have any.

Mr. Taft: I want to emphasize the application of these chemicals. The growth of a tree is made early in the season and if you delay the application of nitrate and phosphate until later you will fail to get the effect on the growth of the trees. I would advise applying at least three weeks before the trees blossom and you will then get more moisture to make more effect on their growth.

I might say a word regarding some experiments we have been putting on the last year on cherry, plum and apple trees. That on the younger trees that have been in cultivation in cover crops and very good class of soil we fail to see any effect in the growth. The cover crops have been improved by the use of chemicals and indirectly you have got to get the results from that. The same is true in the sod land. In the sod lands you have to use some mulch or manure around the roots of the roots of the trees with either nitrate or sulfate, half pound to 5 pounds and upward to larger bearing trees and with practically the same amount of the acid phosphate. We also used with these potash but as yet failed to get any results.

Chairman: Any further questions along this line, if not we will take up the next topic "Suggestions for Experimental Work in Horticulture" by Mr. Low.

Mr. Low: Mr. President, Members of the State Horticultural Society I certainly feel unqualified to make any suggestions along this line for two reasons: the first place, I am not a practical fruit grower because I disposed of my two farms the latter part of December and the only reason that I did not refuse my good friend Mr. Farrand to do anything along this line is because he never refuses. For that reason I did not refuse. I feel unqualified to make very many suggestions along this particular line.

One thing I notice around Farmers' Institutions and our meetings where we have any College men particularly, and I do not refer to any person in particular, they used to refer to this up here as the College. "We do this up at the College." I like to think of this place as our Experiment Station. I have a son at home who may attend college. I like to think the College is for him, the Experiment Station is for myself and the rest of us who are thrashing our our every day problems. That is just merely a suggestion.

There is a lot of work carried on here. They carried on experiments on all kinds of soils and the different fertilizers but they don't seem to go just far enough. We want to remember this is a commercial production with us. We figure on it in the end. I would like to see some dusting experiments carried out and see if we can't carry the experiment with half of the dust.

We hear from down in the dewberry region that they would like the dewberry crossed up with their hardier varieties. They would like to get out of the trouble of burying their dewberries every fall, although this may be a blessing in disguise.

The raspberry growers would like a type of clover that will stand the winter because they are in need of a cover crop that will give a lot of tonnage for the humous needs and will not root very deep.

One other thing that would be very important in this Institution is a cold storage. It seems to me that it is high time this Horticultural Society gets behind this Horticultural Department and finds some means to have a cold storage. I understand that the experiments of the game are not being carried on simply for the lack of place to keep the Horticultural facilities of this State. Everything is a little bit of a cold storage. I believe I have a cellar at home that will keep apples as well as that. How are we going to do these things in a kind of a place like that. There is plenty of work that could be done along the line of annual pruning and bud formation in getting some of our semi-annual bearers to be annual bearers, Baldwins for instance. There is plenty of work to do along the Entomology line. We must not confuse this with the Experiment Station. We must have better equipment and means to really demonstrate what has already been proven to give good results. I think Mr. Farrand just wanted me to start this ball a rolling. I would like to have what some of the rest of you have to say along this line.

(Applause)

Mr. Rogers: There is a Gentleman in this room that has had considerable experience in dusting and if it would be in order I would like to have him give some remarks on it. I refer to Mr. Cheney who has done a lot in the dusting of apples and other fruit.

Chairman: Mr. Cheney we would like to know something about dusting.

Mr. Cheney: My experience in dusting has passed over a period of five years. I have used no liquid at all. I think there are possibilities in dusting especially for the man that has a lot of hills to climb.

Question: Did you get good results this last year?

Mr. Cheney: No, I did not. I used three dusts this year on part of the trees and two on the others but I have kept fruit clean with seven dust applications but with two or three applications you can't do it. As far as the cost is concerned I think the cost is greater than with the liquid. That is my experience. There are other things to consider in the dusting proposition. If you have a rough farm and can't get over the hills in time with the liquid, the dust will prove of greater value and you can put it on at the time you want it, where you could not do it with the liquid. In the last two years I have made a pretty good showing on this plat. If there are any more questions that I can answer I will be glad to do it.

Chairman: On this particular subject "Suggestions for Practical Experiment" from the fruit growers themselves. We have these fellows

at the College and they want us to tell them what problems trouble us. If we do at any time they take it into consideration.

Question: How much of the dust troubles you?

Chairman: We are going to get away from that dust. I want to keep to this subject. I will say right here, along that subject that I would like this College to take up very seriously this dusting proposition before they tell anybody what to do. I tell you I won't tell them anything to do right now.

Mr. Halligan: We have been working since 1916 on the dusting proposition and we have probably carried on dusting experiments on a more extensive scale than any time in the past. For three years we have carried on dusting tests here in the southwestern part of the State and in the Grand Traverse section. We expect to continue the work in those sections the coming year. As far as apples are concerned we have been very successful concerning the scab. As far as cherries are concerned we have been what a commercial grower would call successful with fungus on the cherries but our experiments show that it has not controlled the fungus as well as the liquid. On the dusting proposition with the apples while they have been very successful we are not confident at the present time with our present program when it comes a wet season. For that reason we have not recommended it and do not intend to recommend at the present time the use of the dust as a substitute for the spray. We will give you our results and will recommend it to growers who cannot cover their trees with the spray at the proper time. Now in other States of the Country they have not been as successful as we have been by the use of the dust in controlling apple scab or pear scab and some other diseases. Whether that is due to the fact that they are not efficient, do not apply it at the right time, or because their climatic conditions are different we are not able to tell. This dusting is a new proposition and two seasons are not enough. We will simply give you the results of our experiments as quick as they are available so you can apply them to your condition as nearly as you can. I would say if a grower can get on a liquid spray, put on the liquid spray because it is cheaper. We are hoping that the dusting proposition will develop and that we will get dust possibly finer and get better machinery so that in the near future our dust will be just as efficient as our liquid spray. We don't expect it to be better than the spray. Better only if the man can do a more efficient job in dusting than in spraying. At the present time the one advantage is that you are able to get it on at the critical time.

Member. I want to give my support to what Mr. Low has said in regard to a spirit of cooperation between the practical fruit grower and the Experiment Station at the College. Now think of the College in two ways. We send our Children there to get a College education, think of the Experimental Station as taking up these problems of growers. It is the practical fruit grower that has the problems. It is the fellow that is out in the orchard that gets these problems. We need some sort of a Committee that can be appointed by this Association of practical producers that can work in cooperation with Experiment Station and keep a closer spirit of cooperation and keep this idea before both the growers in the way of results and before the Experiment Station in the way these things ought to be worked out. If it is in order I would like to make this motion, that the Society appoint a Committee of fruit

growers to work in cooperation with the Experiment Station as these problems come up in a revised or right way and other capacities that we can work it.

Mr. Halligan: I support the motion.

Chairman: How many do we want?

Member: About five is the general number.

Member: It seems to me if a thing of that kind is to be carried on it has got to be over a field broad enough to get practical results. You would have to have a man from each locality in order that you get some definite knowledge as to our experimental work in connection with the College.

Mr. Farrand: We don't want too large a Committee. The larger your Committee the less you get anywhere. You want a grower to represent each kind of fruit, one to represent the grape growers, one to represent the apple growers, etc. That is the kind of a Committee we want. We hope out of this to have cold storage that will amount to something. We are just starting in fruit growing here and all of these different problems are coming up. If we need equipment at our Experiment Station the fruit growers should get back of the movement and go to our Legislature and get money to supply those needs. The first thing that we need is a new building. The Horticultural Building is a relic of the past. It is a disgrace to the State and the fruit growers are to blame. You get what you want and they can go on and do effective work with the equipment. We must have men that will get back of this movement and push. That is the kind of a Committee that we want.

Chairman: Any more questions?

Mr. Miller: I notice that the remark has been made to work down the Lake shore. Bear in mind Oakland County too. A year ago we planted a thousand young trees in Oakland county and I believe one of our problems in the future is going to be storage problems and I would like to see our Experiment Station do some work on that.

Chairman: Probably the best thing will be to leave this in the hands of the Executive Committee. The Executive Committee will appoint a Committee of 5 to act with the Horticultural Department of this Experiment Station in regard to experiments that must be carried on.

All in favor of this signify by saying "Aye." Carried. Mr. Secretary The Executive Board will meet at this time tomorrow and will appoint that committee.

Member: I know there is quite an interest in cold storage proposition investigation work that might be carried on by the Experiment Station. I think we ought to have some sort of an idea as to what a thing of this sort would cost. In 1911 or 12 we built in a small cold storage equipment at the Oregon Agricultural College which cost about $3,500. To carry on the work that we should carry on there and to meet the cold storage problems that would eventually confront the growers we should have probably not less than 8 or 10 storage rooms. That would take care of some fruit that we would use for the College work and about 75% of the space could be turned over for Experimental Station Work.

It would not be wise to construct a separate cold storage building, to be used solely for such a purpose. A cold storage equipment could be better and more economically installed as a part of a large building

containing all the laboratories needed in the several phases of Horticultural investigation.

Chairman: We want a great big Horticultural Laboratory. We are all in favor of that. We will take the appropriation down to the Legislature that we want and if we put it down as low as we can get it we may stand a chance of getting the appropriation.

Question: Did the fellows here at the College ever try using just a little lime sulphur with the peach spray?

Chairman: I have never used any poison in the peach spray yet.

Question: Do you have any trouble with peaches rotting.

Mr. Dutton. We never got any results on peaches about Grand Rapids. We did until the brown rot came and we got no results from our Experimental work. We got results on other things but peaches did not pay.

Mr. Farrand: Can you tell them about the brown rot in other States?

Prof Halligan: In Georgia they have had good results in controlling the brown rot. The use of lime sulphur, eight pounds of lime, eight pounds of sulphur to 50 gallons of water.

Question: How do you account for their peaches all rotting this year? I see by the reports in Georgia that the peach growers are very much exercised over the results of this year. I thought you might have some definite information as to what they did. They have proved this, that the boiled lime and sulphur was a success but there has been a great deal of dusting on these orchard in Georgia. I wonder if it would not have been better if they had left off the boiled lime and sulphur and used just the dust.

Prof. Halligan: They are not doing anything.

Mr. Crane: They harvest their crop of peaches in Georgia in the rain and they hardly ever deliver a car load of peaches in good order. They rot down with the brown rot. Whether we got the germs of brown rot by using cars that they used by not fumigating those cars or it may have come from some other source. We did not have the brown rot in our orchards as we have it now unless it was in the North. I would like to get some definite information to just what they have gone through that has brought such results as this year.

Prof. Halligan: They don't have the brown rot year after year. They will spray for a year or two and give it up. As far as your proposition is concerned your peaches might be covered with brown rot when they left the farm but they have not developed it. If you go into railroad yards you will find lots of carloads of peaches and fruit that have diseases of this sort in transit. A car of peaches can stand around for a week and not develop brown rot. You must have brown rot in your orchard.

Now the men of the Exchanges seem to have trouble once in a while. As Mr. Kelder is not here, Mr. Barron of Fennville will take up this subject.

Mr. Barron: Mr. President, we are supposed to have a discussion of Exchange problems in relation to production. I believe by the program Mr. Kelder should have talked first. Mr. Kelder stayed at home. He showed good judgment.

To start off with I would like to get this into a form of discussion. I want to know how many market through fruit Exchanges? We have got

probably 40. Now, how many through the Federal Fruit Exchange? A few here. Now, then I believe they are all honest. Most farmers are honest and I want to be absolutely honest. How many of our Fennville growers who are present were satisfied with their sales this year? Get your hands up if there were any.

Member: We had to be satisfied. We were in it and could not get out.

Question: I noticed that your Fennville people say you were satisfied. Why were you satisfied? Did you not get all that the market demanded, all that it would stand? If you did you ought to be satisfied.

Mr. Barron: Maybe I should not have said it in that way. I can't understand what I am to talk about. We have some problems in relation to production. I don't know what he had in mind, the proposition of each Exchange man starting out in the spring and advising fruit growers when to spray, how to spray and when to cultivate, etc. on down through or whether he had in mind some other problems. Exchange men can be of some help to growers occasionally when they get on to something that is all right that we can pass out to them. Other times we get on to something that is all wrong. To illustrate last season we had a little trouble in getting lime for peach spray. I had an idea they would ship better spraying with the mixture of glue and sulphur. It looked all right and we could buy it. I sent out a circular letter and got some formulae. It worked fine up to the point where they put poison in it and did not put any lime in it. One of my growers came to me and said that I had ruined his peach orchard and I had. We know that something is needed along that line. We believe we can make quite an improvement. The freight charges are high and packages are higher and they are going to stay higher than they were two years ago. The money that fruit growers make is going to be made in the better grades. It costs as much to deliver a poor grade as a good one. If we can get on something that will raise our grading ten per cent it will pay well. We have discussed this at different times and we came to the conclusion that we could hire a field man to do this and could go out and advise the growers. We put that proposition up to them and I believe that three out of four of our growers voted "No." It seems like it was going to be up to them to look around and hire a man to sell the low grades at no one price. Now I am going to call on some of the Exchange members that are from Fennville and ask them. I would like to ask Mr. Hamilton if he knows of any way that the Manager could help him in raising crops?

Mr. Hamilton: I don't know. Probably he could if he was wide awake and was very interested in it and knew various new things that come up and better qualified than the fruit growers in the Exchange, he probably could.

Mr. Barron: If he were better qualified but can he be? He has got other problems to think about. I think the Manager has plenty of problems in the Exchange to handle. It is doubtful if he would be of much benefit in the raising of fruit. I think it is the business of the farmer to look after the raising of the crop although the manager may help at it sometimes. I think if the office is well equipped so that you can get out circulars that we can be of some service to the growers. We will be careful in the future in advising a man to use glue and there

may be some other new things that will come up and some of them will be all right. I think where we fell down we put in arsenate of lead when we ought to put in some lime.

Member: Mr. Taft has a formula of using glue for brown rot. It will prove out one of the most excellent formulae for brown rot. I think we ought to carry it out. If I put in arsenate of lead I will put in lime. Maybe we could hear from Mr. Taft.

Mr. Taft: As for its noted importance glue has been used for years in New York and I have been successful in controlling brown rot. The quantity used was very small that it could not do any harm. We did not use arsenate of lead. Sulphur wet thoroughly with a solution of glue then diluted so that we got about four pounds of sulphur to 50 gallons of water. The material was used for experiments on brown rot. Substitute for it is boiled lime sulphur. That, of course, is more effective but it is difficult to prepare without danger of burning. Regarding the boiled sulphur, I was in Chicago a month ago where they had men from all over the country. We discussed the result of lime sulphur and they all agreed we had good success when you had a low temperature and very much moisture especially if you had open heads to allow the air to pass through and dry out the trees but they all agreed that in wet seasons that you could not control the brown rot.

Question: I would like to ask how much glue they used?

Mr. Taft: The formula I gave was to dissolve one ounce of glue in a gallon of water and mix in with that four pounds of sulphur until you have a thick paste and then at that add 50 gallons of water.

Mr. Barron: I have taken up 20 minutes now and as I do not know anything about the glue business I will give the rest of the time to Mr. Slater from Millburg. Thank you.

(Applause)

Mr. Slater: When I received the notice from Mr. Farrand stating that my name was on the program I told my wife that I would be like the darky who was passing the cemetery one night very late and a moonlight night. He was looking back over his shoulders all of the time. He noticed a ghost walking along side of him. Mr. Darky didn't stop to ask any questions, he simply started to run as fast as he could. Finally he dropped down on a log to recover and pretty quick the ghost caught up with him, set down side of him and said, "Rastus you surely can run." Rastus, "And just as soon as I can get my breath I am going to run some more." I may start to run before I get through.

(Laughter)

Mr. Chairman, Ladies and Gentlemen: I have been asked by your Secretary, Mr. Farrand, to discuss the topic of Exchange Managers Problems and their relation to Fruit Production, and when I state that the past season was my first experience as an Exchange Manager you will agree with me that it is rather difficult question to talk upon, especially so as we have with us today men who have long been very successful as managers and are therefore more able to talk on this question than I am. The past season was the worst in the history of Michigan in a great many ways in so far as the farmer was concerned and all of our Associations worked more than to capacity during the entire season. Our greatest problem was the more than poor transportation facilities which we were compelled to put up with, during not only part, but the

entire season, it being a case of fight for every car that was set in at our siding. At the start of the season I was inclined to blame the most of our trouble in not being able to obtain refrigerator cars to the fact of our Association not being on a main line, but according to all reports we fared better than quite a number of Associations who are on a main line, therefore the only conclusion to draw is the inefficiency of the railroads. The question of obtaining cars to ship our fruit in is one of our main questions and there should be some way of compelling the Railroads to furnish cars when needed. Last spring we had promise after promise that there would be plenty of cars and no one need worry about same and while we all realized the fact that in many cases our crops were from two to six times what we anticipated same would be, the fact remains that the Railroads did not make any effort to relieve the situation to any extent, consequently a great many of our farmers lost hundreds of dollars and to say the least this is a blow to any man who has worked hard to raise a crop and then finds he is unable to get it to market. Some of you people here today may feel that this meeting is not the proper place to bring up this question but allow me to say that this same question affects your Society and College here as well as every farmer present a great deal more than you may think. No matter what you or I think the fact remains that if the farmer is unable to get his crops to market especially at a time when his crops are large and he has a chance to make a little money as he did have last season he will soon become discouraged and wish to quit the farm and when the farmer feels this way, how will the farmers' sons feel? The farmers have been the goats in past years and today is the only man in the world who has nothing whatever to say regarding price he shall receive for what he has to sell. Therefore, I say it is about time the farmer had his say. Few people outside of the actual farmer realizes the fact that the farmer of today must not only work but must study as well if he hopes to become successful. Our Colleges and Societies are doing wonderful work and without them we would not get very far with our farming today. This fact is being realized more and more each year and I venture to say that today you will find very few farmers but what wish to send their boys to College if able to do so. As an Exchange Manager I am often asked many questions pertaining to the treatment of the soil as well as the crops and as I lack the knowledge of you old farmers I simply turn to one of your College circulars and if unable to find an article covering the question I simply write to College and the desired information is promptly furnished free of charge. I fully believe that through the efforts of our Colleges, Associations, Farm Bureaus, etc., that the day is coming when the farmer will not be compelled to set back and always let the other fellow dictate prices and make all the profit as he always has done in the past. But in order to accomplish this we must stick together and stick to the finish. We handled an enormous crop of fruit the past season and had it not been for our Associations I fully believe that we would not have received one-half what we did receive for same. This may sound like a very broad assertion, to any one who is not a member of an Association but just stop for a moment and figure what it would have meant the past season had all our fruit been dumped on our nearby markets. As it was, they were simply flooded all during the season and the Boat lines were unable to handle the small part they did handle without a shortage or a

loss account of delay on a great many of our shipments so it is an easy matter to see what the result would have been had they been compelled to handle all instead of only a part of our crops. You are all well acquainted with the facts concerning the package question the past season and know what a big steal it was. Therefore, we do not feel it is necessary to go into any details regarding them except to say that I believe the time is coming when the farmers will own their own package factories and by so doing cut out considerable expense. In closing I simply wish to read you figures showing amount of fruit handled the past season by our Association at Millburg.

Having lived in a large city for 27 years I have been on both sides of the fence and know that the great majority of people living in large towns and cities are under the impression that the farmer is the man who has always made the money but we, who are or have been farmers know that the other fellow is the one who has made the easy money while the farmer has done all the work and run all the risk. The farmer does not want anything but what is fair as well as a voice in naming the price he shall receive for his crops.

Chairman: Any questions?

Our Summer Meeting will be held in Oceana and Mason Counties. Those are the best counties in the State and it will make everyone want to attend. Everyone is invited to attend. The people up in that country I am sure will give you a very warm welcome.

Mr. Farrand. Before we close I want to say that I believe there is a great room for membership in this State Horticultural Society. If I am going to be Secretary we are going to have more members than in the past two years, because you can't keep up these programs and go on with this work without their support and the fees are not large. If the Society is worth anything it is worth keeping up.

Chairman. If there aren't any more remarks we will adjourn and hope to see you all at the Summer Meeting.

Meeting adjourned.

FINIS

HORTICULTURAL SOCIETY AND M. A. C. ADOPT NEW POLICY.

A new policy originated at the mid-winter meetings of the Michigan Horticultural Society when the Society asked its president to name a committee representing the several fruit interests of the State to meet with the experimental workers of the Department of Horticulture of M. A. C. for the purpose of bring about a closer relationship and understanding between the fruit growers and their problems on the one hand and the Department of Horticulture and its work on the other. The appointment of this committee was the direct result of a discussion of "Suggestions for Experimental Work in Horticulture from the Viewpoint of the Practical Fruit Grower" at the mid-winter meetings of the Michigan Horticultural Society held at M. A. C. during Farmers Week.

Each member of the committee has been selected as specifically representing some one or two of the fruit interests of the State and because of his special knowledge and practical experience in producing such fruit crops. Furthermore, most members of the committee are extensive growers of practically all kinds of tree and small fruits. The personnel of the committee is as follows.

G. A. Hawley, Hart, President, ex-officio	
C. E. Buskirk, Paw Paw, Chairman	Grapes
Geo. Friday, Coloma	Small fruits
Robt. Anderson, Covert	Peaches and plums
H. Blakeslee, Crane, Fennville	Apples and pears
Harry Rackham, Northville	Apples
A. J. Rogers, Beulah	Cherries

The meeting of this committee which was the first of the kind ever held in the State, was called by Professor C. P. Halligan, Head of the Department of Horticulture, February 23rd and 24th at Grand Rapids for the purpose of going over lines of experimental work suggested and outlined by the Experiment Station workers; to receive criticisms and suggestions from the committee regarding the work countemplated and to receive suggestions as to new projects that should be started.

Plans for grape experiments were presented which are designed to determine the effects of different fertilizers upon the growth, maturity and yield of vines. The experiment is planned to take care of any soil variations that may be encountered. At the suggestion of the committee, it was decided that tests be made to determine the maximum amounts of nitrogen that could be safely and economically applied to vines.

Outlines for grape pruning experiments planned to determine the number of buds that may best be left on vines of low, medium and high vigor, and to determine which buds, with respect to location, are the most productive and satisfactory buds to leave, were presented.

It was pointed out that co-operative experiments with grapes had been unsatisfactory in New York and that the grape growers should make some arrangements whereby the Experiment Station could have the full charge of one or more vineyards in the grape sections for a term of years.

The committee requested the Department to plan fertilization tests with small fruits, such as red and black raspberries, with and without

irrigation, along the same general lines as those outlined for grapes, to be done in Berrien and Van Buren counties.

The committee approved of the Department's plans for further comparative testing of dusting and spraying on all kinds of fruits and potatoes; the development of contact dusts and cheaper and more efficient dust mixtures; the development of copper dusts for grapes, cherries and potatoes; the development of satisfactory spreaders for insecticides and fungicides, and experiments for the control of pear psylla, pear and apple scab, peach leaf curl, brown rot, grape leaf hopper and grape berry moth.

The committee visited the Graham Experimental Farm near Grand Rapids where the following experiments are being carried on.

A test to determine the comparative effects of grass sod mulch, alfalfa sod mulch, and clean cultivation with cover crop upon yield and growth of Duchess apple trees and their relative needs of nitrogenous fertilizers.

An experiment to determine the relative effects of such cover crops as rye, millet, vetch, oats, and clover, upon growth and yield of apple trees and to find out which cover crop returns the greatest amount of humus to the soil.

An experiment with a young orchard to determine the comparative values, costs and effects of growing apple orchards with such treatments as alfalfa sod mulch, with and without applications of nitrogen; alfalfa sod with a straw mulch substituted for the hay mulch; and a clover sod with straw substituted for the hay mulch to be compared with a plot in cultivation and cover-crops.

An experiment to determine the time at which nitrogen should be applied to peach orchards and to note the results associated with applications made at different times.

A comparative test of sod mulch supplemented with fertilizers and cultivation with cover cropping for sour and sweet cherry orchards.

A pruning experiment, involving six standard varieties, to determine whether young apple trees should receive no pruning, light pruning or severe pruning during the first eight to twelve years of the orchard's life and to determine if non-pruned trees should be more heavily fertilized than pruned trees.

Because of the disagreement among apple growers as to the amount of pruning young trees should receive, an experiment similar to the above was planned, at the request of the committee, in an orchard of five-year-old Jonathans near Grand Rapids.

Plans for an experiment to determine to what extent biennially bearing varieties of apples can be made to bear in off years or annually through pruning, heavy fertilization or a combination of both were discussed and perfected.

Tentative plans of the department for apple pollination work to determine the degree to which Northern Spy, Duchess and Hyslop Crab are self-sterile and if so what varieties should be interplanted with them, were endorsed by the committee.

Outlines of plum pollination experiments to determine whether varieties of the several groups of plums would serve as efficient pollenizers for other groups were presented and additional crosses suggested by the committee. The need for cherry and pear pollination tests was emphasized and plans made whereby practical tests will be made by several growers.

The committee requested the department to experiment with a Duchess orchard in Berrien County, in which individual tree performance records have been kept for six years, to determine if the low yielding trees could be made to produce crops equal to those of the high producing trees.

That the committee will be a valuable asset to the department and the fruit interests of the State and will function for good, was clearly demonstrated at its first meeting. Nearly every experimental project presented was thoroughly discussed and seldom did they escape without undergoing some form of alteration or addition that would better fit them to meet the more pressing problems of the fruit growers.

The committee, in many cases, took upon itself the task of finding or providing orchards and fruit plantations in which the several experiments might be conducted. Because of the limited funds at the disposal of the department for conducting investigations, the committee volunteered to make arrangements with fruit exchanges and growers to furnish some of the fertilizer.

Every effort was made by the committee to thoroughly familiarize itself with the conditions under which the department is working. It was astonished to learn of the limited facilities at the disposal of the department and deplored the fact that more funds were not available to carry out investigations in the industry which brings more money into Michigan than any other agricultural pursuit.

Plans were discussed for bettering facilities for investigational work in Horticulture and the committee instructed its members to acquaint the fruit growers of the State of the facts and to urge the growers to get behind a movement to secure a suitable Horticultural building and equipment. A sub-committee on publicity was appointed whose duty it will be to acquaint the fruit growers of the state with the activities of the committee, the lines of investigation which are under way and the progress being made along the several lines. In other words, the Horticultural Society, through this committee will convey the results of investigations of the department to the fruit growers.

That the Horticultural Society took a big step in bringing about a closer relationship and understanding between the Society, the fruit interests of the State and their experimental workers, through the appointment of this committee, is to state the facts mildly.

The third annual mid-summer automobile tour of the Michigan State Horticultural Society through Oceana and Mason counties, August 2, 3 and 4, was attended by a jolly but business-like crowd of more than 300 fruit growers representing 21 Michigan counties and three states. The tour was educational from the time it formed at the Graham Horticultural Experiment Station west of Grand Rapids Tuesday noon until it ended on the shore of Lake Michigan about five miles south of Ludington early Thursday afternoon.

Fully 200 interested fruit growers gathered at the 100-acre Horticultural Experiment Farm, half of which was recently given to M. A. C. by Mr. and Mrs. Robert Graham, during the forenoon and were conducted through the young orchards where the newly inaugurated cultural, fertilization and pruning experiments with all kinds of tree fruits were explained by Professors Halligan and Marshall. The visitors expressed approval of the experimental projects and voiced a desire to visit the

Station two or three years later to see the results for themselves. Mr. H. D. Hootman, superintendent of the station, was praised for the excellent manner in which the orchards and grounds had been supervised.

After enjoying a cafeteria lunch, provided by the State Horticultural Society, the fruit growers drove to Treasurer Munson's famous Vinecroft Fruit Farm where they inspected some 35 acres of vineyards, some of them past 30 years old, and plantings of other tree and small fruits.

Some 25 automobiles, every one loaded to capacity, made the 80-mile drive from Mr. Munson's to Shelby, arriving there just as the sun was dropping behind the Western Oceana orchards. The hotels were crowded to capacity but the people of Shelby showed their generous hospitality by taking the visitors into their homes.

Early Wednesday morning fully 80 automobiles parked on the streets adjacent to the Oceana Canning Company's plant while the visitors inspected the plant from cellar to garret and upon leaving were presented with cans of beans and peaches and cigars. Because the number of fruit growers and automobiles greatly exceeded expectations, thus lengthening the time required for parking and getting the caravan under way, it was necessary to pass up several interesting orchards.

The first orchard visited Wednesday was that of Thomas Smith, near the Lake Shore. Under most conditions, results from fertilizers on intensively cultivated orchards are not contrasting, but not so in Mr. Smith's orchard for several carloads of hog manure had produced wonderful results in tree vigor and size and set of fruit of the several varieties. Mr. Smith prefers Bordeaux to lime-sulphur as a summer spray because he thinks it results in less burning and cleaner fruit. He had sprayed six times, using the old spray rods rather than guns, and the job was so thoroughly done that the visitors could find only two or three fruits showing scab in a 40-acre block of old trees.

The Session's orchard, recently purchased by Thos. Smith, presented an object lesson in pruning peach trees. Mr. Sessions explained his method of training and pruning, and showed orchards 14, 25 and 32 years of age from which all fruit is picked from the ground and four-foot stepladders. He emphasized the advisability of lowering or renewing the tops of peach trees about once in three or four years. The Sessions trees are open centered ones with three to five main framework branches and, after pruning the tops of the trees, are practically straight across or form a plane. Mr. Sessions has been a noted peach grower for many years and the inspection of his orchards was indeed educational.

Brief stops were made at Mr. Averill and Dr. Munger orchards where cultivation and fertilization were of chief interest. Unfortunately check plots were not left for comparison. At Juniper Beach a cafeteria luncheon was served after several parties had taken advantage of the excellent bathing.

The fruit growers drove through several well laden orchards west of Hart during the early portion of the afternoon where they studied the orchard practices followed. In President George Hawley's orchards results of fertilizer tests on peaches in cultivation were noted, following which Prof. Dutton explained a spraying vs. dusting experiment with Monarch plums. Little fungus had developed but the foliage of the untreated trees was sparse and yellowish, contrasted to the large amount

of dark green foliage on both the dusted and sprayed blocks, demonstrating that both dusting and spraying were apparently equally valuable in maintaining the general health and vigor of the trees and that either paid in spite of little fungus development.

Benton Gebhart's orchard offered an excellent opportunity to study varieties and the effects of top-working varieties on others. Mr. Gebhart has won many prizes at fruit exhibitions and a visit to his orchard of numerous varieties grown under the best of care told the story. Mr. Gebhart, who is one of the oldest members of the horticultural society, and President Geo. Hawley joined in serving every guest peach sundaes on the lawn of the former.

The autos then moved about eight or nine miles east of Hart to Thos. Smith's Walkerville orchard. In spite of the long, dusty trip every man and several women followed the congenial and enthusiastic owner through his 52-acre orchard of thirty-year-old Spy, Baldwin, Wealthy, McIntosh, Wagener, and Jonathan varieties. The visitors were amazed at the enormous crop of absolutely perfect fruit of the several varieties. Some trees had as many as 25 pole props under them. The ground under the Wealthy trees was covered by a layer of withered thinnings. A net return of $25,000 to $30,000 would be a conservative estimate for this year.

Most interest centered about the renewal work in this orchard. Six years ago Mr. Smith noticed that many of his trees has been partially girdled, probably through freezing injury. The bark had died three-fourths the way around some trees and over a distance of as much as four feet along the trunks. Mr. Smith is not the type of man that gives in under adverse conditions, so he began bridging over these seemingly hopeless injuries on 24-year-old trees, with the result that these trees are today in a wonderful state of vigor and are producing crops of ten to fifteen barrels and more per tree. Of course these trees have been "fed." Manure has been used when available and at other times high-grade commercial fertilizers have been liberally used. The cultural system consists of good cultivation every other year with clover sown in late summer to remain as a sod for the following year. It should be added that Mr. Smith is a Chicago commission merchant and must rely to a great extent upon hired help. He provides them with the best of living conditions and consequently gets very good men and he is generous in giving them credit for the conditions in the orchards. A load of watermelons served by Mr. Smith was a fitting climax to the full day of orchard inspection.

The tired and hungry tourists were abundantly served to a tastefully prepared banquet by the ladies of the Congregational Church for the Greater Hart Association Wednesday night, after which Prosecuting Attorney Pugsley welcomed the visitors to the "Hart" of Michigan. Among others to talk were George Hawley of Hart, president of the Society; T. A. Farrand of Eaton Rapids, secretary; James Nicol of South Haven, president of the Michigan State Farm Bureau. Mr. Nicol emphasized the need of better standardization and distribution; pointed to the achievements of the traffic department in steadying the strawberry market by proper diversion of cars; and stressed the need for precooling plants along the lake shore before another small-fruit crop is ready for movement.

Early Thursday morning the long line of cars were moving northward from Hart into Mason county. In Michael Fitch's Montmorency cherry orchard the visitors noted that nitrate of soda applied in May (which was thought to be too late to produce results this season) had forced a much better growth and decidedly more and darker foliage than check plots, and the acid phosphate had produced a slightly better condition then the checks.

At Mr. C. D. Kistler's old apple orchard in heavy sod similar fertilizers were applied at the same time, the nitrated trees showing some effect but no noticeable improvement for phosphates. Had the application been made earlier the results certainly would have been more contrasting. The Butler and Hitchcock orchards both very efficiently managed by women were next rigidly inspected and several men were heard to remark that they would be glad to let these women manage their orchards. The latter orchard had a block of heavily loaded Bartlett pears that were worth travelling miles to see.

The last orchard visited was that of Mr. Smith Hawley, veteran fruit grower and one of the oldest and most ardent workers of the Society. Intense cultivation and thorough spraying had produced a wonderful crop of apples, peaches and pears in spite of the dry season.

Luncheon was served picnic fashion on a high, wooded bluff overlooking Lake Michigan. A short program followed the luncheon at which President Hawley, Smith Hawley, I. T. Pickford, County Agent of Oceana, Kris Bemis, County Agent of Mason, and D. L. Runnels of the Grand Rapids Press made short talks. The County Agents of Oceana and Mason counties were highly complimented for the manner in which they had worked out the details of the trips and handled the large crowds in their respective counties. Mr. Runnells, upon learning that a shortage of funds in the society's coffers would probably make it impossible for it to hold its annual meeting in Grand Rapids in December, had arranged with the Grand Rapids Press by telephone for the meeting to be held in the auditorium of the Press Building without charge and made such announcement before adjournment. The invitation was accepted by the executive committee.

The value of such a tour cannot be estimated. The fact that the attendance of busy fruit growers is growing each year is sufficient proof. Fruit growers have the opportunity to see and judge for themselves and they find a lesson in every orchard visited. The very informal picnic luncheon served on each of the three days and the tramps through the orchards offer an opportunity for growers from distant parts of the state to rub shoulder to shoulder and learn to know fellow fruit growers and their problems. A statement by one of the executive committee, "Making this trip each year is all that keeps me from getting into a rut," shows in one sense the value of such tours.

The society was indeed fortunate in selecting Oceana and Mason counties for the tour this year because it so happens that this is the only section of the state that has a normal crop of tree fruits. In fact most of the apple and pear orchards inspected were carrying full crops of surprisingly clean fruits.

T. A. Farrand, secretary of the Society and Extension Specialist at M. A. C. made the general arrangements and was in charge of the tour, and the tourists are appreciative of his efforts and consequent success. The next annual tour will be through Van Buren and Allegan counties.

Roy E. Marshall,
Assoc. Prof. of Horticulture.

LIFE MEMBERSHIP
MICHIGAN STATE HORTICULTURAL SOCIETY

Name.	Town and Street No.	State.
Allis, E. W	Adrian	Mich.
Ansley, C. F	Glennie	Mich.
Aneline, J. B	Montague	Mich.
Anderson, R. W	Clarkston	Mich.
Anderson, Robert	Covert	Mich.
Adams, R. G	Birmingham, Route 2	Mich.
Adams, F. W	Birmingham, Route 2	Mich.
Andrews, Bros. Co	Pittsburgh, 54 21st St	Pa.
Averill, A. R	Hart	Mich.
Armstrong, W. H	South Haven	Mich.
Abbot, Gail, T	Medina, Barrett Co	Ohio
Bailey, L. H	Ithaca, Cornell University	N. Y.
Barker, Klaus	Holland, Route 11 Box 97	Mich.
Baldwin, O. A. D	Bridgman	Mich.
Ballard, Ralph	Niles, Route 4	Mich.
Barden, F. J	South Haven, Route 6	Mich.
Barnhart, Herbert	Fremont, Route 1	Mich.
Bassett, C. E	New York City, N. Am. Fruit Exchg	N. Y.
Bauman, F. A	Hart, Route 3	Mich.
Becker, D. N	Hesperia, Star Route	Mich.
Beckman, Geo. H	Ludington, Route 3	Mich.
Bennett, S. Oscar	Holland	Mich.
Bishop, Dr. H. A	Millington	Mich.
Blue, George	Traverse City	Mich.
Pickard, P. W	Boston, Box 229	Mass.
Bowells, J. H	Northport	Mich.
Brackett, G. B		
Brassert, Walter, O		
Bristol, W. H	Almont	Mich.
Brown, F. E	Traverse City	Mich.
Brown, G. L. A	Decatur	Mich.
Brubaker, C. S	Hartford	Mich.
Bryant, C. T	South Haven	Mich.
Brunson, Dr. E. E	Ganges	Mich.
Buckman, R. M	Sodus	Mich.
Bullock, A. M	Lapeer	Mich.
Burham, W. P	Ionia	Mich.
Burton, Farley, J	Mitchell	Ind.
Burrows, Geo. L. Jr	Saginaw	Mich.
Beatty, F. E	Three Rivers	Mich.
Buskirk, M. D	Paw Paw	Mich.
Bingham, C. A	Detroit, Chamber of Commerce	Mich.
Bregger, L. A	Bangor	Mich.
Blake, J. R	Galesburg	Mich.
Birney Bros	Lansing, Birney Elec. Co	Mich.
Bagley, Wm. D	Traverse City	Mich.
Blanding, F. J	Lansing, Ford Sales	Mich.
Bristol, W. K	Almont	Mich.
Bentall, Alfred	Allegan, County Agent	Mich.
Brown, F. H	Benzonia	Mich.
Bos, M	Hudsonville, Route 3	Mich.
Bingham, Geo	Birmingham, Route 2	Mich.
Bishop, A. R	Coloma, Route 3	Mich.

Name.	Town and Street No.	State.
Bregger, John	Bangor	Mich.
Bristol, E. C	Birmingham, Route 5	Mich.
Bazil, Chas. E	Hillman	Mich.
Brubaker, A. A	Wequetonsing	Mich.
Bingham, Samuel	Birmingham, Route 1	Mich.
Beebe, A. H	Birmingham, Route 1	Mich.
Bassett, W. A	Birmingham, Route 1	Mich.
Button, D. B	Farmington, Route 1	Mich.
Bemis, K. B	Scottville, County Agr'l. Agent	Mich.
Boyce, James	Holland, Route 8	Mich.
Bohuet, Fred	Kalamazoo, Route 10	Mich.
Bull, John	Bailey, Route 1	Mich.
Blanford, H. B	Fremont	Mich.
Brown, A. N	Louisville, Dosch Chemical Co	Ky.
Beal, J. L	Manitou Beach, Route 1	Mich.
Brinkham, O. S	Traverse City, Old Mission	Mich.
Broughten, Herbert	Birmingham, Route 2	Mich.
Banks, Earl	Novi	Mich.
Bush, Lyman	Farmington, Route 1	Mich.
Button, J	Farmington	Mich.
Bachman, Abraham	Coloma, Route 3	Mich.
Burridge, L. T	Benton Harbor, 267 Pleasant	Mich.
Bolton, S. E	Niles, Route 7	Mich.
Buckley, Harry C		
Burnham, Gordon, L	Traverse City, Route 1	Mich.
Braman, Oscar	Grand Rapids, Route 4	Mich.
Brown, Winfred	Detroit, 121 Collingwood Ave	Mich.
Babcock, L. E	Battle Creek, Route 7, Box 208	Mich.
Bangor Canning Co	Bangor	Mich.
Buskirk, Carl	Paw Paw	Mich.
Bissell, T. E. Co	Elora	Ontario,Can.
Caie, Robt	Yarmouth	Nova Scotia
Chamberlain, Glen Gas Co	Grand Rapids	Mich.
Chapman, Austin B	South Rockwood	Mich.
Chatfield, Geo. E	South Haven	Mich.
Cheney, Calvin A	Maple City	Mich.
Coith, Alvin	South Haven	Mich.
Church, Wm. E	Chicago, Title & Trust Bldg	Ill.
Cook, C. B	Pontiac, County Agent	Mich.
Cooper, Madison	Calcium	N. Y.
Countryman, E. J	Dixon, 111 Galena Ave	Ill.
Crane, John H	Fennville, Route 1	Mich.
Crawford, Robt. J	Armada	Mich.
Curtice, J. E	Coleman	Mich.
Cribbs, W. C	East Lansing, Markets Dept	Mich.
Chesebro, C. C	South Haven, Route 3	Mich.
Campbell, J. P	Jacksonville	Fla.
Conrad, Seth	Waylands	Mich.
Clark, Fred K	Sparta, Route 19	Mich.
Crane, U. S	Fennville, Route 1	Mich.
Coryell, R. J	Birmingham	Mich.
Coryell, Ralph I	Birmingham	Mich.
Cowan, S. J	Rockford	Mich.
Campbell, C. E	Kalamazoo, Route 10	Mich.
Case, A. R	Frankfort	Mich.
Case, Stanley, L	Franklin	Mich.
Campbell, William	Walled Lake Route 2	Mich.
Clark, Frank D	Novi	Mich.
Cleaver, J. W	Northville, Route 1	Mich.
Charles, A. W	Buchanan	Mich.

Name.	Town and Street No.	State.
Coleman, Emmer	Farmington	Mich.
Carter, Fred Jr	Benton Harbor, Route 2	Mich.
Charles, C. B	Bangor	Mich.
Carnahan, J. F	Adrian, Route 3	Mich.
Closson, Ben. H	Northville, Route 2	Mich.
Crane, H. B	Fennville	Mich.
Carter, David	Armada	Mich.
Cleopman, F. J	Northville	Mich.
Celery City Nursery Co	Kalamazoo	Mich.
Darlington, Frank	Hesperia	Mich.
Davidson, C. M	Rockwood	Ohio
Davis, Horace, W	Lapeer	Mich.
Davis, W. H	Perrington	Mich.
Dayton, J. H	Painesville	Ohio.
Demaud, J. B		
Decker, Walter, E	Orleans, Route 20	Mich.
Dickinson, Geo. E	Ionia, Stage Route	Mich.
Dickerson, Claud	East Saginaw	Mich.
Dierson, F. B		
Dieckman, Mrs. Josephine	East Saginaw	Mich.
Dietrich, M. J	Arcadia	Mich.
DuMez, John	Holland	Mich.
Dutton, Chas. S	Holland	Mich.
Dykeman, J	East Saginaw	Mich.
Day, D. H	Glen Haven	Mich.
Dow, H. H	Midland	Mich.
Dickinson, W. W	St. Joseph	Mich.
Dittman, Wm. H	Dryden, Route 2	Mich.
Dowd, A. J	Hartford, Route 3	Mich.
Damon, C. A	Fenton	Mich.
Dukesherer, P. D	Benton Harbor	Mich.
Dean, Douglas	Coloma, Route 3	Mich.
Daly, W. E	Benton Harbor, Route 4	Mich.
Dohm, N. W	Sodus	Mich.
Dickinson, Donald	Benton Harbor, Route 4	Mich.
Eckard, W. C	Paw Paw, County Agr'l. Agent	Mich.
Edwards, O. C	Battle Creek, Sanitarium Store	Mich.
Elsworth		
Ernsberger, R. J	Watervliet	Mich.
Ewald, E. W	Hartford, Route 3	Mich.
Elliot, Eugene	Pontiac, 330 Auburn Ave	Mich.
Emery, Nelson C	Benton Harbor, Route 1	Mich.
Eidsen, A. W	Berrien Springs	Mich.
Enders, Dr. Arthur	Benton Harbor	Mich.
Everett, Orin	Farmington	Mich.
Ehinger, F. C	Adrian	Mich.
Farley, Fred	Almont	Mich.
Farrand, T. A	Eaton Rapids	Mich.
Field, Wm. A	South Chicago	Ill.
Forelich, J. O		
France, J. G		
Freeman, Mrs. Agnes	Ann Arbor, 419 N. State St	Mich.
Freund, Chas	St. Joseph	Mich.
Friday, George	Coloma	Mich.
Friday, Jacob	Coloma	Mich.
Frost, Frank H	South Haven, Route 6	Mich.
Fisher, J. W. Jr	Milwaukee, 433 Lake Drive	Wis.
Flint, W. D	Novi	Mich.
Freeman, L. A	Fenton	Mich.
Flint, L. B	Novi	Mich.

Name.	Town and Street No.	State.
Fosdick, Royal	Pontiac, Route 6	Mich.
Field, H. George	Birmingham	Mich.
Flinn, James	Detroit, 1220 Penobscot Bldg	Mich.
Farrand, W. F	Eaton Rapids	Mich.
Frue, Ernest	Hopkins	Mich.
Fred Funk	Bangor	Mich.
Fitch, R. J	Ludington, Route 3	Mich.
Flory, H. E	South Haven	Mich.
Garfield, Chas W	Grand Rapids, 200 Burton St. N. E	Mich.
Gathman, Mrs. Augusta		
Gebhardt, Benton	Hart	Mich.
Geisler, Wm	St. Joseph, Route 2	Mich.
Geddes, Davis	Saginaw	Mich.
Getz, Geo. F	Holland	Mich.
Gebhardt, N. W	Hart	Mich.
Grand Traverse Fruit Co	Detroit, 1008 Ford Bldg	Mich.
Grant, John F	Chicago, 2710 Indiana Ave	Ill.
Gray, W. B	Traverse City	Mich.
Green, S. A	Hillsdale	Mich.
Greening, Charles	Monroe	Mich.
Graley, Joseph	Pontiac	Mich.
Geister, Jacob	Watervliet, Route 3	Mich.
Gibson, John I	Battle Creek, Ass'n of Commerce	Mich.
Green, Smith	Walled Lake, Route 2	Mich.
Griggs, Perry C	Romeo, Route 2	Mich.
Gilmore, Miles J	Old Mission	Mich.
Gowdy, H. W	Union Pier	Mich.
Grimmer, Edward	Farmington, Route 1	Mich.
Graham, S. W	Farmingotn, Route 1	Mich.
Graham, Jay	Farmington, Route 1	Mich.
Green, Arthur, R	Walled Lake, Route 2	Mich.
Gow, Charles, F	Farmington, Route 1	Mich.
Graley, Lewis	Pontiac	Mich.
Green, B. G	South Haven	Mich.
Gleason, E. F	Sodus	Mich.
Gibson, Robt. J	Northville, Route 2	Mich.
George, Edwin S	Pontiac, Route 3	Mich.
Green, Howard, A	Walled Lake, Route 2	Mich.
Greening Nurseries Co	Monroe	Mich.
Galbreth, A. A	Bangor	Mich.
Graves, Henry	Detroit, 2134 Dime Bank Bldg	Mich.
General Chemical Co	New York City, 25 Broad Street	N. Y.
Hale, Chas. F	Coopersville	Mich.
Hall, Louis A	Orleans, Route 1	Mich.
Hall, Alfred R	Buchanan, Route 4	Mich.
Hall, Luther, E	Ionia	Mich.
Halstead, J. B	Farmington	Mich.
Halbregger, Louis	Woodburn	Mich.
Hamilton, Frank C	Northville	Mich.
Hamlin, J. H	Bravo, Route 1	Mich.
Handy, Fred	Sodus	Mich.
Hawley, George	Hart	Mich.
Hayes, N. B	Muir	Mich.
Hayden, Mrs. H. A	Jackson	Mich.
Heinze, Edward, F	St. Joseph, Route 2	Mich.
Henstreet, F. H	Bellaire	Mich.
Heuser, J. H	Chicago, 2162 Monadnock Bldg	Ill.
Hills, R. Carroll	Ann Arbor, Route 9	Mich.
Hinebaugh, Wm. H	Ottawa	Mich.
Hoffman, M	St. Joseph	Mich.

Name.	Town and Street No.	State.
Houge, H. H	Sodus, Route 1	Mich.
Holloway, Geo. F	Sawyer	Mich.
Hoopes, Abner	West Chester	Tenn.
Hopkins, A. L	Bear Lake	Mich.
Hosner, O. G	Oxford, Route 1	Mich.
Howard, J. H	Arcadia	Mich.
Howe, J. C	Brighton Sta., Clover St	Mich.
Hubbard, Geo. M	Hudsonville	Mich.
Huey, Harod E	Shelby, Route 2	Mich.
Hughston, J. A	Harbor Springs	Mich.
Hunt, L. C	Eaton Rapids	Mich.
Hutchins, Edward	Fennville	Mich.
Hinkins, W. A	Benton Harbor, Route 4	Mich.
Hopf, Geo		
Hardie Mfg. Co	Hudson	Mich.
Hayes Pump & Planter Co	Galva	Ill.
Hartman, W. P	Lansing, State Dept. of Agr'l	Mich.
Helsel, Floyd	Grand Rapids, Route 2	Mich.
Henion & Hubbell	Chicago, 219 N. Jefferson St	Ill.
Hulst, Mrs. Henry	Grand Rapids, 100 Fountain St. E	Mich.
Hough, F. W	Almont, Route 2	Mich.
Howard, L. N	Farmington, Route 1	Mich.
Howard, N. E	Farmington, Route 3	Mich.
Hunter, L. R	South Lyon	Mich.
Hamilton, W. L	Bangor	Mich.
Hall, Brinton, F	Belding	Mich.
Handy, Chas	Sodus	Mich.
Hooper, Roy H	Old Mission	Mich.
Hartman, Mrs. S. B	Athens	Mich.
Hill, Irving, D		
Halstead, Chas. H	Farmington, Route 1	Mich.
Higby, Clarence	Birmingham, Route 2	Mich.
Heuser, Mrs. J. H	Chicago, 1262 Monadnock Bldg	Ill.
Herman, G. R	Coloma	Mich.
Hanson, Chas	Buchanan, Route 1	Mich.
Hemingway, Earl	Sodus	Mich.
Hinkle, C. R	St. Joseph	Mich.
Hobbs, Fred A	Benton Harbor	Mich.
Heliker, Charles, W	Walled Lake, Route 2	Mich.
Hunt, J. Cecil	South Haven, Route 1	Mich.
Higley, G. W	Kibbie, Route 1	Mich.
Humphreys, J. E	Casnovia, Route 2	Mich.
Huff, Vernon	Grand Rapids, Route 4	Mich.
Halligan, C. P	East Lansing, Horticultural Dept	Mich.
Ilgenfritz, C. A	Monroe	Mich.
Jenks, S. G	Shelby	Mich.
Johnson, R. L	Lawrence	Mich.
Johnson, William	Vassar	Mich.
Jacklin, J. R	Fremont	Mich.
Johnston, J. C	Kibbie, Route 2	Mich.
Jackson, C. G	Birmingham	Mich.
Jakway, J. J	Benton Harbor	Mich.
Jessup, Maude, M	Grand Rapids, 440 Thomas St	Mich.
Johnston, J. F	Hartford	Mich.
Yager, Henry	Douglas	Mich.
Kales, Dr. John D	Chicago, Savings Bank Bldg	Ill.
Keasey, E. L	South Haven	Mich.
Keith, B. H	Sawyer	Mich.
Keith, Bert, W	Sawyer	Mich.
Kellogg, Herbert	Ionia	Mich.

Name.	Town and Street No.	State.
Kempf, Geo. J	Tecumseh	Mich.
Kennedy, Thos	Hesperia, Route 3	Mich.
Kennedy, Wm	Hesperia, Route 3	Mich.
Keppel, Thos	Zeeland	Mich.
Kettle, Burt	Coopersville	Mich.
Kingsley, H. J	Washington, 1342 Parkwood Place	D. C.
Klein, F. J	Farmington, Route 1	Mich.
Kniebes, C. C	Watervliet	Mich.
Knight, David & Son	Sawyer	Mich.
Krebs, Geo. J	Northport	Mich.
Kelley, Bros. Nurseries	Dansville	N. Y.
Keeler, B. A	Lenawee Jct	Mich.
Krake, R. G	Coloma	Mich.
Kleine, John	Birmingham, Route 2	Mich.
Krause, J. B	Coloma	Mich.
Kenter, V. A	Fennville, Route 1	Mich.
Kelley, Joseph A	South Haven, Route 3	Mich.
Kirby, Clarence, J	Monroe, 914 E. Front St	Mich.
Kelder, Otto	South Haven, 751 Wilson St	Mich.
Ladd, E. U	Old Mission	Mich.
Lasch, A. A	Suttons Bay, Route 2	Mich.
Lass, Peter, H	Bear Lake	Mich.
Lawrence, F. E	Cressey	Mich.
Lawrence, L. L	Decatur	Mich.
Leggett, E. E	Fennville	Mich.
Lingsley, Geo. W	Harbor Springs	Mich.
Lincoln, L. C	Greenville	Mich.
Loomis, P. B	Jackson	Mich.
Lord, E. G	Arcadia, 56 Rural	Mich.
Low, Geo. M	Bangor	Mich.
LaDuke, L. B	Lawrence	Mich.
Lawrence, A. P	Delton	Mich.
Lymburner, H. A	Sparta, Route 3	Mich.
Loeveridge, F & Son	Fennville, Route 1	Mich.
Lurkins, H. J	Benton Harbor	Mich.
Loomis, R	Lansing	Mich.
Macauley, T. B	Montreal	Canada
Mugill, R. M	Chicago, 158 LaSalle St	Ill.
Maguire, H. W	Jackson, 11 Deys St	Mich.
Mann, Clyde Allison	Chicago, Rand-McNally Bldg	Ill.
Mann, S. B		
Marshall, W. C	Chicago, 112 W. Adams St	Ill.
Matheson, Frank	Elberta, Route 1	Mich.
Mead, A. F	Battle Creek, Route 11	Mich.
Merritt, H. E	South Haven, Route 2	Mich.
Merritt, J. E	Chicago, 123 W. Madison St	Ill.
Messer, G. W	Almont	Mich.
Methven, C. S	Holland	Mich.
Miller, Chas. H	Glen Arbor	Mich.
Miller, Frank	Northville	Mich.
Miller, John T	Birmingham	Mich.
Mitchell, Jas	Almont	Mich.
Monroe, Mrs. Clara O	South Haven	Mich.
Moor, Mrs. Samuel	Rapid City	Mich.
Morgan, Samuel M	Chicago, 1301 Ashland Bldg	Ill.
Morrow, R. E	Central Lake	Mich.
Morse, Miss Anna	Old Mission	Mich.
Mullen, James	Manistee	Mich.
Murry, James P	Albion	Mich.
Munson, J. Pomeroy	Grand Rapids, Knapp Street N. E	Mich.

Name.	Town and Street No.	State.
Myhan, Geo. H	South Haven	Mich.
Morris, Chas. D	Ypsilanti, 106 N. Summit	Mich.
Miller, J. W	Fremont	Mich.
Mannering, E. B	Ann Arbor	Mich.
Maloney Bros. & Wells Co	Dansville	N. Y.
Monat, L. J	New Britain, 61 Grove Hill	Conn.
Morehouse, J. B	Fenton	Mich.
Meyers, F	Alamo, Route 13	Mich.
Munro, J. O	Novi	Mich.
Marvin, O. F	Holton	Mich.
Murdock, C. A	Walled Lake, Route 2	Mich.
Mathews, Dan	Walled Lake, Route 2	Mich.
Mowrey, C. H		
Moser, W. B	Berrien Center	Mich.
Mellen, R. H	Benton Harbor, Route 4	Mich.
Miller, John L	Coloma	Mich.
Michigan Farmer	Detroit, 432 Lafayette Blvd	Mich.
Monroe, George	South Haven	Mich.
Marshall, R. E	East Lansing, Horticultural Dept	Mich.
Murphy, Dennis E	St. Joseph, Route 2	Mich.
McCallum, Neil	Hesperia	Mich.
McClatchie, G. C	Ludington	Mich.
McCutcheon, R. F	Big Rapids	Mich.
McGuire, J. Fred	Chicago, 101 Washington St	Ill.
McHardy, A. J	Almont	Mich.
McDermid, F. H	Battle Creek, Route 1	Mich.
McKinney, W. J	Birmingham	Mich.
McIsaac E	Benton Harbor, Route 4	Mich.
McCracken, H. W	Farmington	Mich.
McKinney, S. E	Birmingham	Mich.
McKenna, H. S	Chicago, 819 Randolph W	Ill.
Nall, Louis A		
Neff, David	Ravenna	Mich.
Nielson, Henry L	Ionia	Mich.
Nelson, C. A	Northport	Mich.
Newhall, Benj	Chicago, 840 Otis Bldg	Ill.
Newhall, John	Thompsonville	Mich.
Nichols, W. W	Ann Arbor, Geddes Ave	Mich.
Nichol, James	South Haven	Mich.
Nitt, M. C	Ravenna, Route 1	Mich.
Newberg, Fred	Grand Rapids, Route 2	Mich.
Nafziger, Herbert	Benton Harbor, Route 5	Mich.
Newton, H. S	Hart	Mich.
Newman, W. A	Pontiac	Mich.
Northern Fire Apparatus Co.	Minneapolis	Minn.
O'Donal, R. H	Howard City	Mich.
Olney, B. J	Beeman	Mich.
Overton, F. J	Bangor	Mich.
Overton, Miller	Bangor	Mich.
Palmer, W. S	Kalkaska	Mich.
Partridge, Newton A	Chicago, 1601-69 W. Washington	Ill.
Pease, F. D	Sparta	Mich.
Pennell, Ray L	Traverse City, Box C	Mich.
Perry, Geo. L	Mt. Pleasant	Mich.
Perry, Jacob, H	Goodison	Mich.
Peterson, J. M	Manistee	Mich.
Pierce, Geo. W	Harbor Beach	Mich.
Peterson, Oscar H	Northport	Mich.
Port, Geo. O	Benton Harbor, Route 1	Mich.
Pratt, W. M	Watervliet	Mich.

Name.	Town and Street No.	State.
Prentiss, Judge Wm	Bravo	Mich.
Preston, Wm. F	Fremont	Mich.
Prettyman, O. G	Scottville	Mich.
Pugsley, M. H	Paw Paw	Mich.
Pickford, I. T	Hart, County Agr'l. Agent	Mich.
Peters, R. C	Omaha, 4822 Cass St	Neb.
Port, Ben J	Coloma, Route 2	Mich.
Peters, E. H	Benton Harbor, Route 3	Mich.
Partridge, Newton L	East Lansing, Horticultural Dept	Mich.
Porter, Frank L		
Peabody, Stanley	Birmingham	Mich.
Pickett, Jesse W	Calidonia	Mich.
Persing, M. J	Frankfort	Mich.
Pratt, B. G. Co	New York City, 50 Church St	N. Y.
Power, L. A	Farmington, Route 1	Mich.
Phillips, John	Lawrence	Mich.
Purdee, William	Pontiac, Route 6	Mich.
Patch, Vernon	Pontiac, 254 Orchard St	Mich.
Pickward, P. W	Boston, Box 229	Mass.
Pettibone, Chas	Farmington	Mich.
Ranney, D. D	East Lansing	Mich.
Rasmussen, R. J	Marlett, Box 416	Mich.
Read, G. P	New York City, 119 Duane	N. Y.
Reed, P. A	Beulah	Mich.
Reynolds, H. G	Pasadena, 257 California St	Cal.
Richmond, E. D	Pentwater	Mich.
Riker, Dr. John	Pontiac	Mich.
Robbins, W. H	Bangor, Route 4	Mich.
Robotham, Jay	Beulah	Mich.
Rockey, Clyde W	St. Joseph	Mich.
Rogers, A. J. Jr	Beulah	Mich.
Rogers Bros	Alpena	Mich.
Rowe, Geo. E	Grand Rapids, E. Fountain	Mich.
Ruckman, H. P		
Russell, C. N	Manistee	Mich.
Russell, J. B	Wheaton	Ill.
Reilly, Wm. J. Nurseries	Dansville	N. Y.
Reed, C. P	Howell	Mich.
Rawson, W. A	Ludington, Route 1	Mich.
Ross, A. L	Rochester	Mich.
Reed & Cheney	Grand Rapids	Mich.
Rack, Samuel H	Grand Rapids, City Library	Mich.
Reynolds, Miss Ellen	Kalamazoo, 713 W. Vine St	Mich.
Rockwell, Judge K.	Pontiac	Mich.
Rood, Paul J	St. Joseph	Mich.
Russell, M. F	Bangor	Mich.
Remer, W. J	Benton Harbor, Route 2	Mich.
Reed, J. W	Benton Harbor, Route 1	Mich.
Rood, Ed. A	Covert	Mich.
Russ, E. V	South Bend, Route 5	Ind.
Rackham, H. G	Northville, Route 2	Mich.
Root, Eugene	Novi	Mich.
Richards, Charles	Benton Harbor, Route 1	Mich.
Richard, J. A	Eau Claire	Mich.
Riker, Dahue, A	Chelsea, Route 3	Mich.
Samuelson, Norman	Chicago, 4404 Wilson Ave	Ill.
Satterlee, James	Lansing, 913 W. Ottawa St	Mich.
Scales, J. C	Chicago, South Water St	Ill.
Schenebeck, Edwin		
Schreiber, Thos	Fennville	Mich.

Name.	Town and Street No.	State.
Scott, Dr. Austin	New Brunswick	Mich.
Scott, Mrs. C. W	Grand Rapids	Mich.
Scott, E. H	Ann Arbor	Mich.
Scudder, C. B	Augusta	Mich.
Sessions, Chas. A	Hollywood, 1455 Brunson Ave	Calif.
Sessions, Horace	Shelby	Mich.
Sheffield, Wm. E	Benton Harbor	Mich.
Shepard, Leon	Fennville	Mich.
Sheridan, John	Hudsonville	Mich.
Sherk, Ralph	Grand Rapids, 151 Clinton St	Mich.
Sherwood, R. H	Watervliet	Mich.
Shirley, W. H	Allegan, Route 8	Mich.
Simmons, F. P	Northville, Route 1	Mich.
Sisters of St. Joseph	Kalamazoo	Mich.
Skinner, Dr. E. P	Chicago, Chicago, Save Bank Bldg	Ill.
Sly, Miss Addie	Birmingham	Mich.
Smeltzer, Joseph	Elberta	Mich.
Smith, C. W	Nixon, Route 1	Mich.
Smith, Henry	Grand Rapids, Monroe & Division	Mich.
Smith, Howard B	Winona	Ontario
Smythe, Robt. A	Benton Harbor, Route 4	Mich.
Snyder, Wm E	Hart	Mich.
Southbeck, Fred H	Hammond, 217 Indiana Ave	Ind.
Stahelm, R. J	St. Joseph	Mich.
Steams, J. H	Kalamazoo	Mich.
Steele, Julius		
Steere, B. W	Carthage	Mich.
Streator, H. D	Galesburg	Mich.
Stroven, Henry	Fremont	Mich.
Stickey, C. C	Hesperia, Route 3	Mich.
Swanson, Ed	Schemberg	Mich.
Sly, Sarah E	Birmingham	Mich.
Suhm, Erwin, R	Milwaukee, 772 Kinnickinnic Ave	Wis.
Sanitary Germ Tube & Inst	Rochester	N. Y.
Schupert, Harry L	Alpena	Mich.
Spencer, A. G	Kibbie, Route 1	Mich.
Satterlee, Mrs. Jas	Lansing	Mich.
Spicker, W. J	Birmingham, Route 2	Mich.
Stark, Wm. P	Neosho	Mo.
Shackelton, Geo	Grand Rapids, Route 12	Mich.
Sedgwick, J. W. C	Nunica	Mich.
Seeley, Ed	Farmington, Route 3	Mich.
Schneider, August	Benton Harbor, Route 1	Mich.
Spielman, August	Adrian, Route 1	Mich.
Sercomb, H. H	South Haven	Mich.
Sprague, Charles	South Lyon	Mich.
Lesslie Scott & Sons	Bangor, Route 1	Mich.
Stone, A. G	Niles, 309 Main St	Mich.
Tallant, C. W	Shelby	Mich.
Thayer, Mrs. Cecilia	Benton Harbor	Mich.
Thayer, Mrs. Dora	Wooster	Ohio
Thomas, R. G	Three Oaks	Mich.
Thompson, T. G	Benton Harbor	Mich.
Thompson, W. D	Jackson	Mich.
Tilly, John S	Watervliet	Mich.
Toland, F. J	Ludington	Mich.
Tracey, W. W	Washington	D. C.
Tyler, Comfort A	Coldwater	Mich.
Tobacco By-Products & Chemical Co	Louisville	Ky.

Name.	Town and Street No.	State.
Thatcher, H. H	Pontiac, 188 W. Pike St	Mich.
The Modoc Co	Philadelphia, 1040 Drexel Bldg	Pa.
Tucker, Carue	Kibbie	Mich.
Thomas, G. H	Shelby, Route 3	Mich.
The New Way Motor Co	Lansing	Mich.
Tibbitts, Karl	Farmington, Route 1	Mich.
Taft, Prof. L. R	Lansing, State Dept. Agr'l	Mich.
Tibbits, Artimus	Farmington, Route 1	Mich.
Tucker, Amos	Kibbie	Mich.
Thornton, W. H	Farmington, Route 2	Mich.
Tennant, Hale	East Lansing, Markets Dept	Mich.
Teichman, W. W	Sodus	Mich.
Upham, Mrs. Mary C	Old Mission, Route 1	Mich.
Ulbreight, F. H	Benton Harbor	Mich.
Urion, Alfred R	South Haven	Mich.
Van Noredall, Fred	Three Rivers	Mich.
Vaughan, Leonard H	Chicago, 31 W. Randolph	Ill.
Vaught, L. O	Jacksonville	Ill.
VonHerff, Baron	Chicago, 4945 Sheridan Road	Ill.
VerDuyn, E. J	Novi	Mich.
Vick, E. C	New York City, The Sun	N. Y.
Vander Heyden, Fred	Ionia	Mich.
VanZee, Cornelius	Kalamazoo, Route 10	Mich.
Van Every, Victor	Franklin	Mich.
Wagner, C. M. H & Sons	Chicago	Ill.
Waite, Walter	Sturgis	Mich.
Walton, L. B	Altica	Mich.
Warren, W. H. & Son	Ravenna	Mich.
Walton, T. B	Chicago, 1426 Republic Bldg	Ill.
Watkins, L. Whitney	Manchester	Mich.
Webber, Miss Francis	Saginaw East	Mich.
Welch, Chas. B	Fennville	Mich.
Wells, Frank D	Romeo, Route 2	Mich.
Western, John	North Chicago	Ill.
Wheeler, D. F	Ionia	Mich.
White, O. K	Lansing	Mich.
Whitney, Granger	Williamsburg	Mich.
Whittne, C. E	Bridgman	Mich.
Whitworth, J. Arthur	Grand Rapids, Mich. Desk Co	Mich.
Weir, Antonie	Monroe	Mich.
Wilde, Chas	Grand Rapids, Route 2	Mich.
Wilder, L. E	Grand Rapids, Route 2	Mich.
Wilkens, F. A	Midland, Dow Chemical Co	Mich.
Willobee, A. M	Old Mission	Mich.
Wilson, Archie	Beulah	Mich.
Wilson, J. G		
Wilson, Wm	Beulah	Mich.
Witmer, A. B	Brown City	Mich.
Whitmer, John	Brown City	Mich.
Wooding, Chas. F	Lowell	Mich.
Woodman, T	Paw Paw, Route 5	Mich.
Woodruff, A. N	Watervliet	Mich.
Woodward, David	Clinton	Mich.
Wendt, K. R	Atlanta, 803 Peach Tree St	Ga.
Way, Geo. P	Pontiac, Route 3	Mich.
Wentworth, N. A	Boston, 60 India St	Mass.
Wilcox, V. O	Benton Harbor, Route 1	Mich.
Woodman, Jason	Paw Paw	Mich.
Webb, Walter	Ravenna, Route 4	Mich.
Warnock, R	Independence	Mo.

Name.	Town and Street No.	State.
Warner, E. E	South Haven, Route 5	Mich.
Whitten, Mrs. C. E	Bridgman, Route 1	Mich.
Walton, Percy, E	Pontiac, 659 W. Huron St	Mich.
Welch, E. A	Walled Lake, Route 1	Mich.
Wenzel, Reinholt	Coloma	Mich.
Wing, Fred M	Hartford	Mich.
Wilkinson, John T	Hartford	Mich.
Willobee, H. G	Old Mission, Route 1	Mich.
Wilde, F. B	Wayland	Mich.
Wilder, Ernest, C	Grand Rapids, Route 12	Mich.
Walsh, Lee S	Walled Lake, Route 1	Mich.
Warner, Fred M	Farmington	Mich.
Webber, H. B	Ionia	Mich.
Webber, W. C	Plymouth, Route 1	Mich.
Wolley, C. L	Coloma	Mich.
Wedow, Albert	Farmington	Mich.
Woodly, C. A	Benton Harbor	Mich.
Wendsel, Richard	Coloma	Mich.
Woodward, Frank L	Clinton	Mich.
Woodbury, C. D	Lansing	Mich.
Yoder, Leon, J	Almont	Mich.
Yapel, Luther, B	Chillicothe	Ohio
Yerkes, Osmond	Northville	Mich.
Ziegler, J. C		
Winder, Dr. C. J	Eaton Rapids	Mich.
Rottier, John M	Fremont, Route 2	Mich.
Wilcox, J	Grand Rapids, Route 7	Mich.
Perkins, H. D	Grand Rapids, Route 4	Mich.
Flemmg, Geo	Shelby	Mich.
Robinette, E. J	Grand Rapids, Route 4	Mich.
Overton, Allen B	Bangor	Mich.
Gooding, Thomas	Fennville	Mich.
Hawley, E. Monroe	Hart	Mich.
Graham, F. E	Grand Rapids	Mich.
Spencer, L. A	South Haven	Mich.
McEwing, Wm	South Haven	Mich.
Leland, George	Fennville	Mich.
Crozed Stave Corp	Grand Rapids	Mich.
Leelg, & Son, J. G	Coloma	Mich.
Stevenson, H. W	Paw Paw, Route 4	Mich.
Olds, R. L	Kalamazoo, County Agr'l. Agent	Mich.
Dukesherer, J. W	Benton Harbor, Route 2	Mich.
Makyes, O. H	Watervliet, Route 3	Mich.

ANNUAL MEMBERSHIPS
MICHIGAN STATE HORTICULTURAL SOCIETY

Name.	Town and Street No.	State.
Burnham, Geo. L	Traverse City, Route 1	Mich.
Barron, J. A	Fennville	Mich.
Beaton, Albert	Benton Harbor, Route 2	Mich.
Blemhuber, Robt	Marquette	Mich.
Broe, P. H	Bravo	Mich.
Evarts, Russell	Owosso, 622 Pine St	Mich.
Grundy, Chas	Athens	Mich.
Granger, F. L	Benton Harbor, State Bank Bldg	Mich.
Gale, C. R	Shelby, Route 2	Mich.
Geisler, Stanley	Hartford	Mich.
Heliger, F. H	Detroit, 3063 Seyburn Ave	Mich.
Hunter, D	Chattanooga	Tenn.
Henry, D. B	Shelby, Route 1	Mich.
Rittase, C. E	Hartford	Mich.
Taft, Howard	South Haven	Mich.
VonCleve, Wallace	Thompsonville	Mich.
Rogers, W. E	Bear Lake	Mich.
Linderman, Roy	Grand Rapids, Route 4	Mich.
Bos, Wm	Byron Center	Mich.
Hickey, J. F	Benton Harbor, Route 4	Mich.
Keillor, C. C	Bear Lake	Mich.
Mawby, W. G	Grand Rapids, Route 4	Mich.
Aresvik, Lars	Grand Rapids, 1813 Jefferson Ave	Mich.
Wolcott, B	Elberta, Elberts	Mich.
Field, E. W	Sparta	Mich.
Pratt, J. M	Eau Claire, Route 3	Mich.
Gamble, J. E	Hart	Mich.
Gillsby, L. O	Decatur, Route 4	Mich.
Coons, A. L	Lowell	Mich.
Gallop, E. R	Lansing, Box 174	Mich.
Wood, N. R	Covert	Mich.
Hootman, H. D	Grand Rapids, Graham Exp. Station	Mich.
O'Brien, E. M	Scotts	Mich.
Whittum, F. B	Eaton Rapids	Mich.
Hunt, C. M	Eaton Rapids	Mich.
Dodge, Roy O	Byron Center	Mich.
Davis, Eugene	Grand Rapids, 525 Glenwood	Mich.
Brake, Davis H	Fremont, Route 1	Mich.
Schaffer, Henry	Sparta	Mich.
Logan, D. E	Quincy	Mich.
Waid, L. F	Byron Center	Mich.
Stratton, Willard	Elberta	Mich.
Lincoln, E. W	Greenville	Mich.
Brigham, C. A	Buckley	Mich.
Sherman, A. E	Homer	Mich.
Spitler, C. C	Hart	Mich.
Munger, Dr. L. P	Hart	Mich.
Thompson, W. R	Suttons Bay	Mich.
Thome, Bert M	Alpine	Mich.
Wyle, W. E	Shelby	Mich.
Gale, O. R	Shelby	Mich.
Kerr, Fred	Shelby	Mich.
Stone, G. B	Hillsdale	Mich.

Name.	Town and Street No.	State.
Stoddard, E. S.	Kalamazoo, Route 12	Mich.
Andrews, R. L.	Coopersville	Mich.
Bettes, C. H.	Sparta	Mich.
Dutton, W. C.	East Lansing, Horticultural Dept.	Mich.
Roberts, Rex	Grand Rapids, Route 5	Mich.
Loeffler, C. W.	Cedar	Mich.
Brown, M. W.	Reed City	Mich.
Brown, B. R.	Grand Rapids, Route 7	Mich.
Tennant Roy R.	Munger	Mich.
Fuller, S. E.	Mears	Mich.
Fish, J. G.	Hart	Mich.
Jacobs, F. R.	Sparta	Mich.
Spangenberg, J. W.	Sparta	Mich.
Shultz, W. J.	Hart	Mich.
Reinsch, Max	Freesoil	Mich.
Knox, R. A.	Fennville, Route 1	Mich.
Minneau, W. J.	Berrien Springs	Mich.
Simanton, F. L.	St. Joseph, County Agent	Mich.
Riley, Owen	Freesoil	Mich.
Levin, Ezra	Lansing, State Dept. Agr'l	Mich.
Kingsburg, Mrs. Luch	Bravo, Route 2	Mich.
Barron, J. A.	Fennville	Mich.
Gross, V. B.	Grand Rapids	Mich.
Bennett, E. E.	Shelby	Mich.
Kennedy, Ed.	Chief	Mich.
Bass, N. H.	Lawrence	Mich.
Otis, George	Hartford	Mich.
Lyman, E. D.	Kibbie	Mich.
Collina, W. E.	Fennville	Mich.
Hawley, H. E.	South Haven	Mich.
Holy, J. B.	South Haven	Mich.
Sercomb, Mrs. Jessie	South Haven	Mich.
Hass, Roy	Coopersville	Mich.
Ewing, Frank	Ross	Mich.
Waller, Geo.	Paw Paw	Mich.
Lincoln Fruit Growers' Association	Stevensville	Mich.
Boucher, Sam	Scottville	Mich.
Brennam, F. H.	Fennville	Mich.
Gilson, Ellis, J.	Sparta	Mich.
Wadsworth, E. W.	Fennville	Mich.
Prater, G. E.	Grand Rapids, 836 Prince	Mich.
Clark, J. T.	Clinton	Mich.
Verdier, J. W.	Mancelona	Mich.
Lilly, L. A.	Grand Rapids, 220 Ashton	Mich.
Package Sales Corp.	South Bend	Ind.
Wortman, W. S.	Fenton	Mich.
Woomest, C. J.	Rockford, Route 2	Mich.
Smith, W. S.	Bangor	Mich.
Welsch, Geo.	Grand Rapids, 242 Delaware	Mich.
Haley, J. C.	Chesaning	Mich.
Vining, K. K.	Grand Rapids, County Agent	Mich.
Long, P. D.	Byron Center	Mich.
Gregger, L. B.	Bangor	Mich.
Tritton, C. R.	Chicago, Sherwin-Williams Co.	Ill.
Matthews, Pringle	Grand Rapids, N. W. Fulton St.	Mich.
Spencer, Bruce	Hudson	Mich.
Wehner, J. J.	Chicago, 936 W. 76th St.	Ill.
Kreft, Geo.	Sparta	Mich.
Leonard, C. F.	Louisville	Ky.

Name.	Town and Street No.	State.
Hitchcock, Mrs. Alice	Ludington	Mich.
Grossman, C. M	Petoskey	Mich.
Howe, Joseph	South Haven	Mich.
Chaddock, Perry	South Haven	Mich.
Rouse, Frank	Shelby	Mich.
Randall, Mark	Traverse City	Mich.
McClary, Orr	Empire	Mich.
Montgomery, Chas	Kent City	Mich.
Blush, F. W	Kent City	Mich.
Watson, Arthur	Grand Rapids, Route 8	Mich.
Anderson, Mels	Kent City	Mich.
Hawkinson Bros	Kent City	Mich.
Snyder, A. G	Greenville	Mich.
Farley, M. E	Albion	Mich.
Fitch, F. M	Ludington	Mich.
Fitch, M	Ludington	Mich.
Shakespeare, A. J	Kalamazoo, Route 5	Mich.
Deleuw, Mathew	Kalamazoo, Route 10	Mich.
Johnston, Wm. F	Cadillac, County Agent	Mich.
Johnston, Stanley	South Haven, Experiment Station	Mich.
Schuller, J	New Era	Mich.
Miller, Bernard	Montague	Mich.
Fugerson, H. G	Columbus, 264 Brighton Road	Ohio
Mead, C. A	South Haven	Mich.
Vary, J. A	Covert	Mich.
Pichel, W. N	Traverse City, Route 2	Mich.
Hebard, F. A	Grand Rapids, Route 7	Mich.
Pratt, Vaughan	Hart	Mich.
Tillitson, Walter	Grand Rapids, Route 9	Mich.
Hasty, Beldon	Hart	Mich.
Lafler, Cecil	Bangor	Mich.
House, E. H	E. Saugatuck	Mich.
Green, Ernest, E	Walled Lake	Mich.
Armour Fert. Works	Chicago, 209 W. Jackson Blvd	Ill.
Upright, C. T	Pottersville	Mich.
Thurston, W. M	Grand Rapids, Route 8	Mich.
Hutchinson, M. C	Fennville	Mich.
Phillip, William	Grand Rapids, Route 4	Mich.
Myers, H. G	St. Joseph, 1418 Lakeview Ave	Mich.
Matthews, V. H	Galva	Mich.
Weekle, Wm. H	Ludington	Mich.
Noon, M. L. & Son	Jackson, Route 9	Mich.
Ranger, J. R	Hartford	Mich.
Fuller, Merrill S	Lawrence	Mich.
Underdown, W. E	Ann Arbor	Mich.
Pickford, V. C	Doster	Mich.
Allyn, G. L	Alpine	Mich.
VanAken, C. T	Hillsdale	Mich.
Hamilton, O. J	Coloma, Route 3	Mich.
Boston, C. H	Manton	Mich.
Coffaa, John R	Alpine, Route 1	Mich.
Skiver, C. E	Detroit, 625 Book Bldg	Mich.
McKenzie, E. P	Marcellus	Mich.
Kistler, C. D	Ludington	Mich.
Owen, Edgar	Onekama	Mich.
McMillen, Victor	Mendon	Mich.
Leland, M. N	Hart	Mich.
Brooks, Walter	Dowagiac	Mich.
Skinner, Ed	Hartford	Mich.
The Trescott Co.	Fairport	N. Y.

Name.	Town and Street No.	State.
Gundy, Chas	Athens	Mich.
Sowels, A. R	Kalamazoo	Mich.
Wellman, H	Nottawa	Mich.
Slenker, Frank	Stevensville, Route 1	Mich.
Weltmann, Henry	St. Joseph, Route 1	Mich.
Brody, Clark	Lansing, 221 N. Cedar St	Mich.
Rittas, E. C	Hartford, Route 2	Mich.
Pugsley, M. H	Paw Paw	Mich.
Wilson, Carl H	Paw Paw	Mich.
Hatchinson, M. C	Fennville	Mich.
Beaton, Albert	Benton Harbor, Route 5	Mich.
Richards, C. T	Plainwell	Mich.
Remer, J. Edio	Benton Harbor, Route 2	Mich.
Hodge Bros	Paw Paw, Route 6	Mich.
Brennen, John	Paw Paw	Mich.
Hartman, C. A	Coloma	Mich.
Waide, C. W	Columbus, Franklin Bldg	Ohio
Loe, W. R	Coloma, Route 1	Mich.
Stoddard, E. T	Kalamazoo	Mich.
Stoddard, L. H	Kalamazoo	Mich.
Smith, Oscar	Waterville, Route 1	Mich.
Rector, Glenn	Sodus, Route 1	Mich.
Ketcham, Paul	South Haven, Route 2	Mich.
Continental Machinery Co.	Chicago, 111 W. Monroe	Ill.
Hussey, A. C	Coloma	Mich.
Hamilton, D. M	Benton Harbor, Route 5	Mich.
Ashman, Fred L	Benton Harbor, Route 1	Mich.
Koob, Lewis	Coloma, Route 2	Mich.
Chi. & South Haven S.S. Co	South Haven	Mich.
Geisler, C. E	Coloma	Mich.
Reynolds, Chas. S	Benton Harbor, Route 5	Mich.
Kreitner, Chas	Coloma, Route 2	Mich.
Chabot, A. H	Riverside	Mich.
Olds, Geo	Benton Harbor	Mich.
Hocker, John	Benton Harbor, Route 2	Mich.
Simpson, J. L	Hartford, Route 2	Mich.
Weifenbach, N	Beulah	Mich.
Kniebes, B. J	Watervliet	Mich.
Kaucher, E	Coloma, Route 2	Mich.
Sabin, Leo. P	Benton Harbor, Route 1	Mich.
Carter, E. A	Coloma, Route 2	Mich.
Kegley, S. M	Coloma, Route 1	Mich.
Scarlett, J. A	Douglas	Mich.
Henderson, Chas	Paw Paw, Route 4	Mich.
Krieger, Jesse L	Benton Harbor, Route 3	Mich.
Rendall, A. L	Benton Harbor	Mich.
Garland, W. E	Berrien Springs	Mich.
Hamilton, C. J	Coloma, Route 3	Mich.
Myers, P. B	Hartford	Mich.
Smith, W. J	Hartford	Mich.
Smith, I. C	Coloma	Mich.
Hanson, E. G	Fish Creek	Wis.

INDEX

INDEX